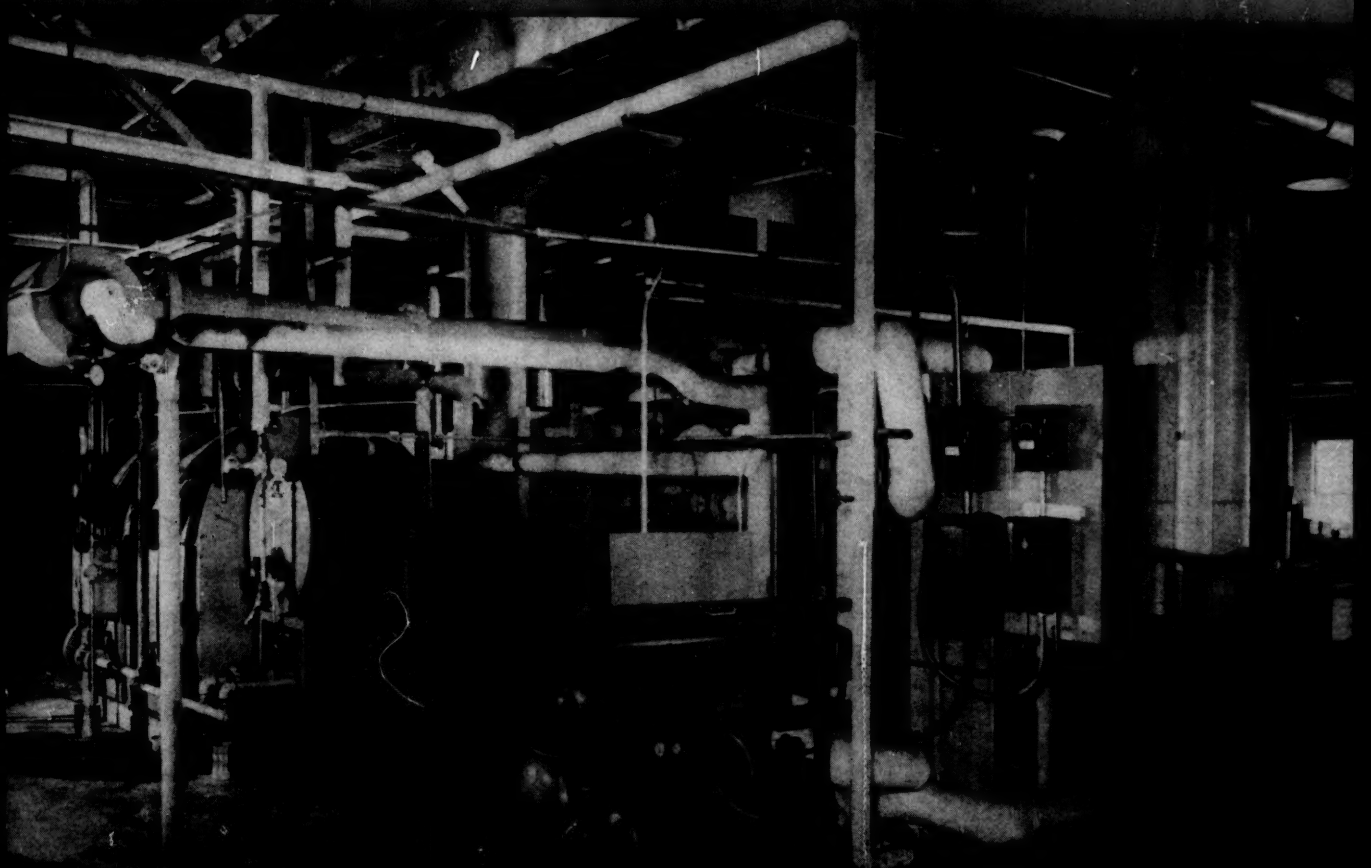
Industrial Refrigeration

JANUARY
1961

For the men who design, sell and operate refrigerating and air conditioning equipment

COVER—A vacuum freeze dehydration plant used in the U.S. Army Quartermaster Depot, Philadelphia, Pennsylvania, to speed foodstuffs. See Page 14.



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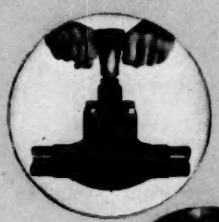
Globe and Angle Types with Bolted Bonnet and Full Capacity Flow

Henry offers the most complete range of sizes and types in the industry. Quality engineering, features of design, proven performance and adaptability to the most exacting specifications and diversified applications have made Henry Wing Cap Valves preferred by architects, consulting engineers, contractors and service men.

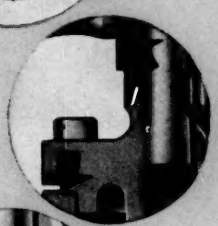
WING CAP SEAL

With Built-in Socket Wrench. For Ease and Convenience in Operating Valve Stem.



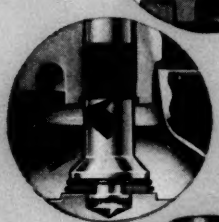
PROTECTIVE GASKETS

Fully Retained. Prevent Loss of Expensive Refrigerant.



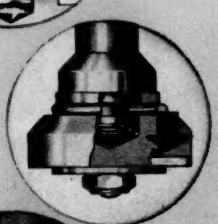
BACK SEATING STEM

Can Be Repacked Under Pressure.



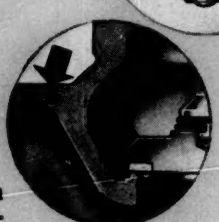
NYLON SEAT DISC

Replaceable, Non-rotating, Self-aligning, Chatterproof.



HEAVY WALL & WEB

Choice of Bronze Alloy or Semi-steel.



Bronze alloy valves have integral O.D.S. connections. Ductile iron valves available with integral F.P.T. connections; flanged type available with brass O.D.S. or steel butt-weld adapters.

HENRY VALVE COMPANY

For Refrigeration, Air Conditioning and Industrial Applications

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THE INDUSTRY'S FINEST...

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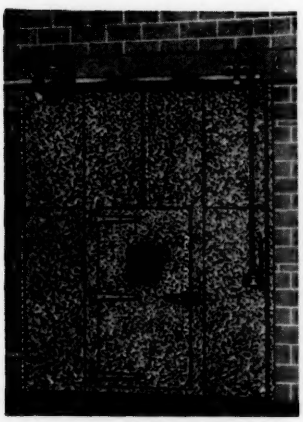
[illegible]sher Boy"

ALL TYPES

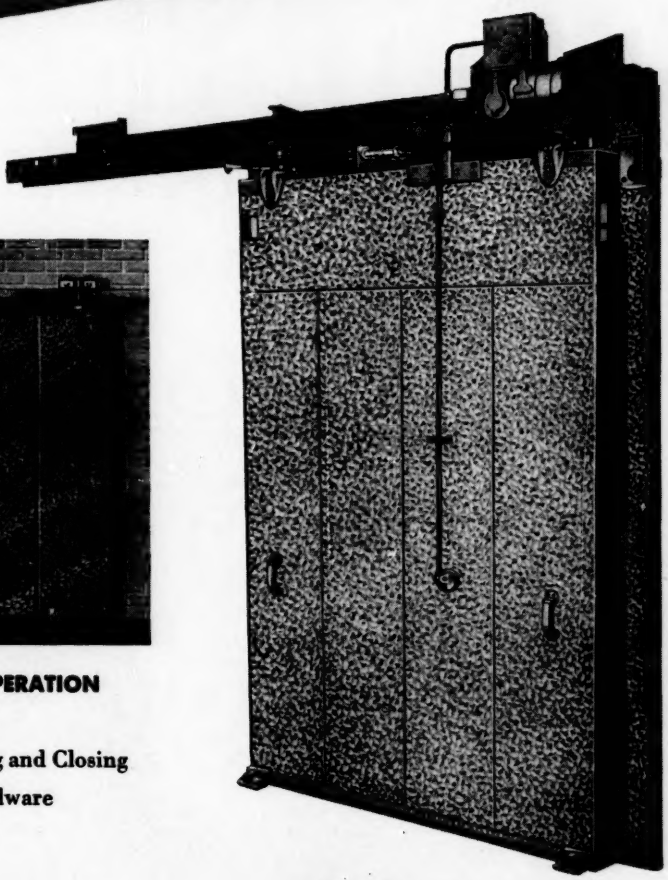


AIR OPERATION

- Safety Entrance and Exit Through Built-In Refrigerator Door
- Speedy Opening and Closing

MANUAL OPERATION

- Dependable
- Easy Opening and Closing
- Durable Hardware



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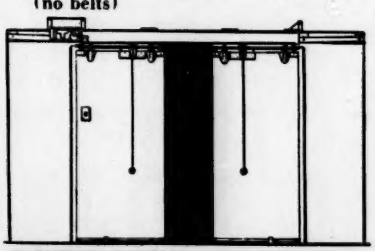
"Electro" SAFETY SLIDE

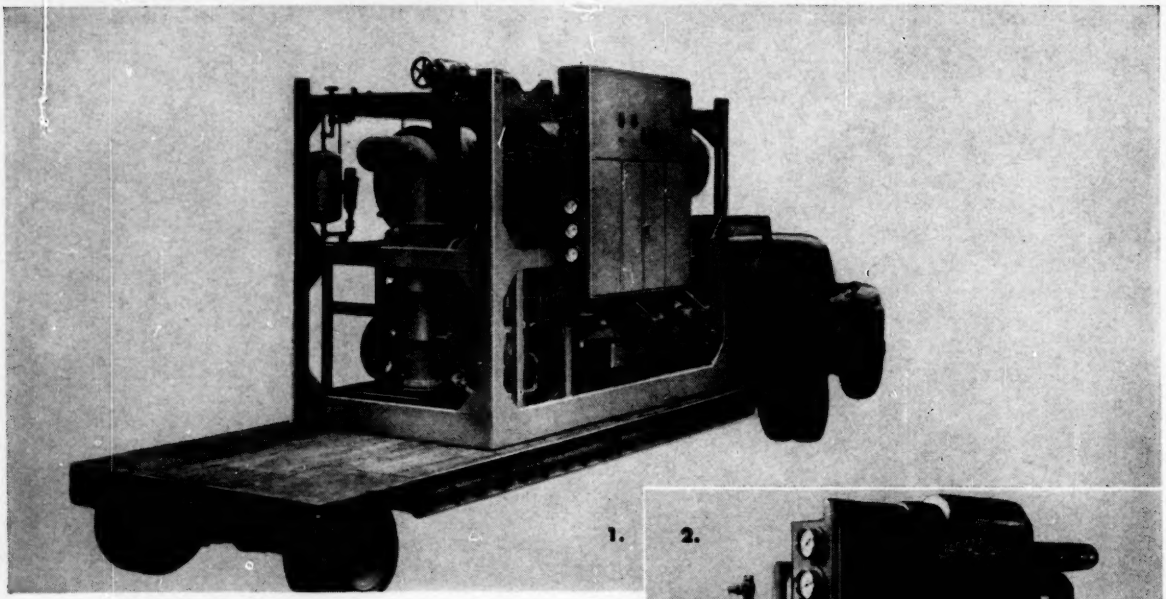
- Structural Simplicity
- Mechanically Sound
- Exclusive Automatic Sealing
- Gear Type Uni-Brake Motor Operation (no belts)

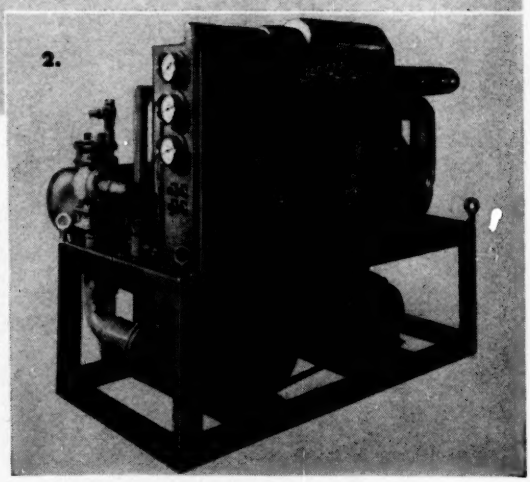


BI-PARTING "ELECTRO" SAFETY SLIDE DOORS

- Recommended where space factors dictate their use
- Gear Type Uni-Brake Motor Operation (no belts)

More Proof of FES-FULLER Superiority





FES-FULLER ROTARY "PACKAGE UNITS"

1. COMPLETE ENGINE ROOM OF HIGH SIDE EQUIPMENT. Ammonia "Package Unit" with FES oil return system, automates poultry freezing tunnel at W. L. Wheatley, Inc., Clayton, Del. It needed merely to be connected to the blast freezer cooling low side and remotely located evaporative type condenser.

2. REFRIGERANT-12 "PACKAGE UNIT" with remote air-cooled condenser automates ice cream hardening room at Penn Dairies, Inc., Gettysburg, Pa.

FES-Fuller "Package Unit" Rotary Boosters Increase Efficiency, Cut Costs

Maintaining low temperatures is made easy with FES-FULLER "Package Unit" Rotary Boosters. Factory assembled, they combine efficiency with economy, and cut field installation costs sharply.

Engine room floor space requirements reduced—these "packages" can be moved into position on a solid engine room floor without need for heavy foundations.

Simplicity of FES-FULLER Rotary Boosters—no valves, connecting rods, pistons or crank shaft—guarantees low maintenance and efficient gas pumping at low temperatures.

Twenty-one sizes of rotary boosters are available to insure balanced performance with high stage compressor.

"Packages" are designed for automatic plants. Booster and high stage compressors start completely unloaded, minimize current inrush and motor starting torque requirements. Exclusive FES-FULLER automatic unloading feature on the rotary booster gives extra step of capacity control where required.

FES-FULLER "Package Unit" Rotary Boosters are in a class by themselves... most efficient, most economical, and greatest total number of installations. Write for complete details. 2716 C-365

FES FULLER

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LOW TEMPERATURE FREEZING EQUIPMENT

V. 140, #1

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January 1961

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A NATIONAL MAGAZINE FOR:
- **Plant Engineers and Operating Personnel**
- **Application Engineers and Contractors**

WHERE REFRIGERATION EQUIPMENT IS USED FOR:
- **Food Freezing, Storage and Transport**
- **Processing and Cooling Applications**
- **Research and Development**

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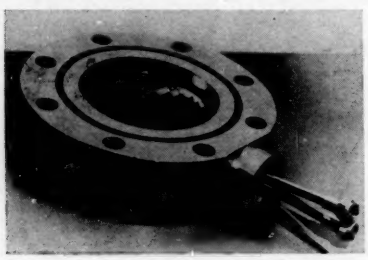
70 Years of Continuous Publication

New Products Designed to Improve Operation

Thermoelectric Vacuum Baffle

A NOVEL thermoelectric baffle for use with existing vacuum systems is now available from General Thermoelectric Corp. This is a completely solid-state device, eliminating the need for conventional,



mechanical, refrigeration equipment. It is not only noiseless, having no moving parts, but also obviates the need for major maintenance. Power consumption is small compared with that used by refrigerant-type currently employed. The price range contemplated for this line of thermoelectric baffles is lower than most conventional types now being offered.

The new baffle concept is the result of a development by Needco Cooling Semi-conductors, Ltd., an affiliated company. The baffle is available in standard sizes ranging from 2 inches to 32 inches in diameter, compatible with existing vacuum-system equipment. Delivery can be made in 60 to 90 days for common sizes.

Conventional-type baffles generally require the installation of pressure lines and employ relatively large amounts of cooling water and electric power for their operation. The thermoelectric baffle is relatively small and compact, employing standard semiconductor elements called Frigistors as the basic cooling means.

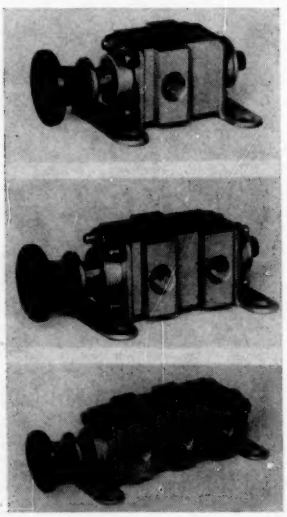
Refrigerant Drier

KENMORE Machine Products, Inc., has developed a new drier incorporating a block desiccant of 100% Molecular Sieves. And, no diluents or additives go into the core. This development is believed to be the greatest advancement in the refrigeration drier field since the advent of Molecular Sieves.

They have a very low pressure drop and high capacity. They will be available to jobbers and dealers in the near future.

Spool Valves

A NEW mechanically or manually operated valve design has been introduced by Hoffman Valves, Inc. for control of air, oil or vacuum. These are ¼" npt, 2-position balanced spool valves available in normally closed or nor-



mally open 2 way or 3 way and 4 way styles. Manual and mechanical operators range from knob operators through lever, clevis, roller cam, over-riding roller cam, foot pedal, treadle, and air operators. These valves are designed for pressures from 29 in. h.g. vacuum to 250 psig.

The new valve segment is the key to the valves' modular design which permits literally thousands of variations in valve styles utilizing less than fifty standardized, interchangeable parts. This means very few spare parts need be stocked by the user. Another exclusive feature is four position porting. Each port segment may be assembled in any one of four positions for maximum flexibility in piping.

On two and three way valves a quick change from normally closed to normally open may be made simply by reversing the spools. Valves may be actuated by any desired methods, mounted in any desired position, with ports and operators oriented independently to suit specific applications.

New Sealant

A POLYURETHANE sealant for a wide variety of industrial uses is being introduced by Du Pont and offers notable advantages over other sealants and calking compounds now in use.

Designated 829-901 Black U. I. Sealant, the new material is a soft, high-modulus composition which is easily applied with either a calking gun or a knife. It comes in a single package, requires no field mixing or curing accelerators, and does not shrink on aging. It has excellent adhesive properties that will withstand significant changes in temperature within the notably broad range of minus 75 degrees to 150 degrees centigrade.

In addition to possessing the properties described above, U. I. Black Sealant is flexible on aging, has good resistance to chemicals, and serves as a barrier protection between dissimilar metals. It will not slump or sag in vertical or overhead installations even in joints as wide as three-fourths of an inch. Because of its stable one-package system and easy application, it also offers savings in labor.

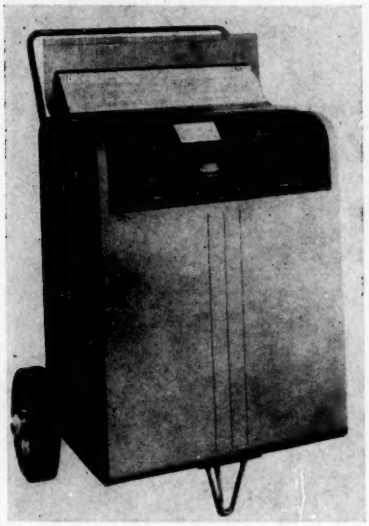
The film-forming urethanes in the sealant provide a tough skin in one to three days, and the material is completely cured to a durable, elastic rubber in 10 to 14 days. It has excellent resistance to water and alkali and is inert to most chemicals, solvents, and corrosive atmospheres.

Mobile Test Cabinets

MOBILE high voltage a-c breakdown testers designed for proof tests, trouble shooting and preventive maintenance programs of industrial electrical distribution systems and equipment, is announced by Associated Research, Inc.

These A-C Mobile Hypot models test insulation breakdown in

large motors and generators, transformers, power transmission cables, switchgear, bushings, and samples of insulating materials.



Output is continuously variable from zero to maximum,through a 10-foot shielded cable. A 4½-inch rectifier type kilovoltmeter is connected directly across the high voltage output, assuring accurate measurements unaffected by regulation or load variations.

The cabinet of the A-C Mobile Hypot models has semi-pneumatic tires and a convenient push-handle, thus affording easy transport for "on-location" testing. Dimensions of the cabinet are 23 inches wide, 21 inches deep, and 41 inches high. Weight ranges from 150 to 250 pounds, depending on rating.

Low Temperature Insulation

THE United States Mineral Wool Company announces the manufacture of Cellofoam low temperature insulation, a closed cell, rigid, expanded polystyrene product. Available in both regular and self-extinguishing forms, Cellofoam is manufactured to a maximum length of 12'4", widths of 12", 16" and 24", and a thickness range of ½" through 8". Tested at a mean temperature of 40°F, it provided a thermal conductivity (k) value of 0.22 Btu's/hr./sq. ft./in./F° and possesses inherently low water absorption and moisture permeability characteristics. Manufactured at a density of 1.0-2.0 pounds per cubic foot. It possesses high bond strength for finishing applications and excellent resistance to impact and compression loads. The product may be applied to masonry, wood, concrete and steel surfaces in applications subject to operating temperatures as low as minus 60° F.

Ball Valve

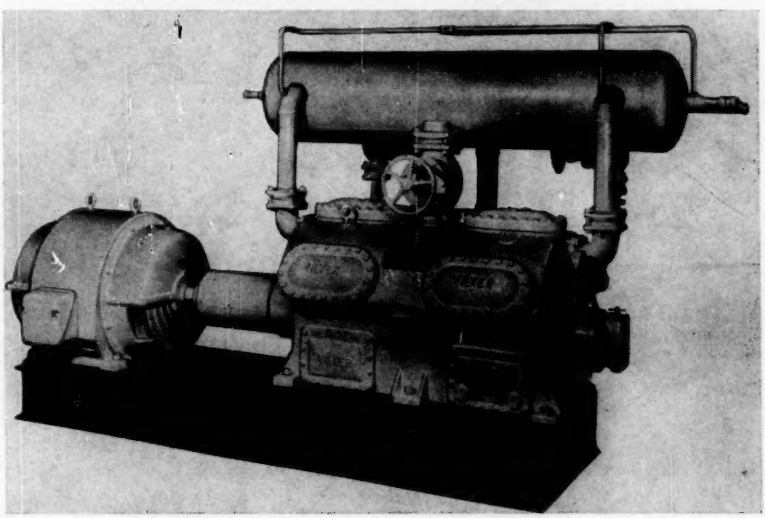
AN entirely new concept in ball valve design is incorporated in the new forged naval bronze valve recently introduced by R-P&C Valve Division of American Chain & Cable Co.

The BL-300, rated at 300 pounds for water, oil or gas service at a maximum temperature of 250 degrees F, available in sizes ½" to 2" inclusive, has undergone hundreds of thousands of openings and closings without signs of leakage or wear.

Fast and easy to operate since it requires only a quick quarter turn of the handle to open or close it is a precision-built valve for general purpose service at a cost no more than a high quality standard bronze gate valve.

The valve has "auto-mating" seats that assure positive sealing in either flow direction which makes it ideal for vacuum service. The perfectly machined ball combines with the "auto-mating" seats for smooth positive operation. The wiping action of the ball across the seats forces out foreign matter and thus prevents abrasive wear which causes the average gate or globe valve to leak.

12-Cylinder, Two-Stage Compressor



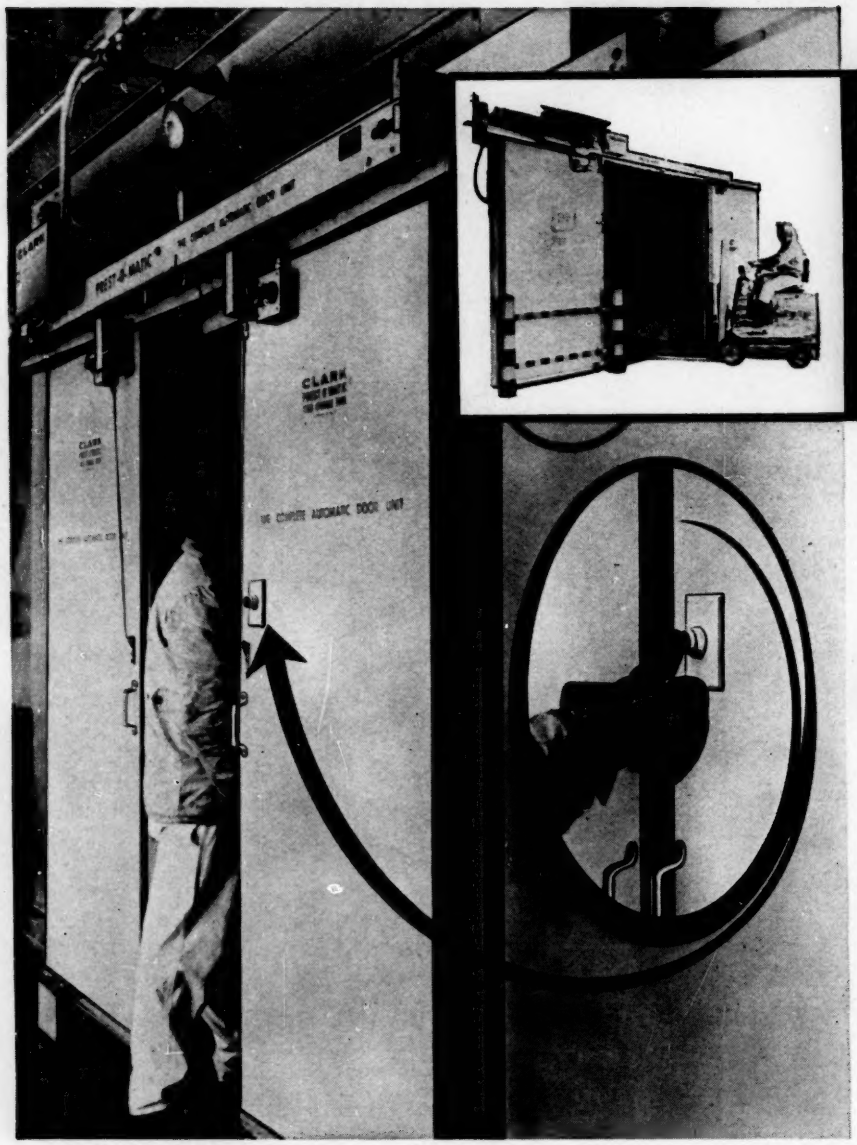
THE Vilter Manufacturing Company has broadened its line of two-stage VMC compressors with the introduction of a 12-cylinder model to supplement its earlier introduced 6-cylinder unit.

With these two units, a range of from 6 through 40 tons of refrigeration is possible depending upon operating conditions. Offered for direct-connected or V-belt drive, two-stage VMCs can be supplied for operation with ammonia, Refrigerant 12 and 22.

Ideal for a variety of applications, the two-stage VMC is especially suited for use where a processing function requires low temperature refrigeration and costs or floor limitations prevent selection of individual booster and high-stage compressors.

Partitions within the frame of the 12-cylinder, two-stage compressor provide separate booster and high-stage sections. Eight cylinder —the center bank and one outside bank—are low pressure while the other side bank is high pressure. A 16" diameter intercooler is used between stages to provide subcooling and desuperheating.

Additional features include removeable cast alloy iron cylinder liners for replacement ease, spring-loaded safety heads and optional 50% unloading and capacity reduction.



Fork truck jockeys need full width openings . . . FOOT TRAFFIC *does not*

NEW P·O·M* PEDESTRIAN CONTROL

cuts open door time by up to **70%!**

No need to open PREST-O-MATIC Cold Storage Doors full width when pedestrians walk through. The New POM (Partial Opening Man) Control saves valuable refrigeration because it opens wide doors only 32 inches for foot traffic.

This exclusive feature can be incorporated in any PREST-O-MATIC doorway — new or existing. POM pushbuttons are mounted on both sides of the door panel. Pressed at either side, the POM Control opens the door just wide enough for comfortable entrance or egress. The door closes PREST-O-MATICALLY behind the pedestrian.

If your Cold Storage doorways are used by foot traffic as well as trucks, you *need* the POM Control. Why not investigate *all* the advantages PREST-O-MATIC Doors give you? Write today for full information.

CLARK DOOR COMPANY INC. Since 1878

Hunterdon St., Newark 8, N. J.

*Partial Opening Man *Control*

news briefs of the month

Seattle Has Big Fish Storage Plant

Seattle, Washington has the largest fish storage plant west of the Mississippi River, according to reports. Operated by the Rainier-Port Cold Storage Company, Jack McGoldrick, president, the plant is on waterfront property owned by the Port of Seattle. It is now in the final stages of a $750,000 modernization program which began two years ago and is scheduled for completion in March of this year. When the project is completed it will have 2,500,000 cubic feet of space for fish and other frozen foods. Partitions were removed so that small storage rooms could be converted into large warehousing areas. Steel reinforced posts provide support for 22,500 tons of food products that may be stored at one time. Refrigeration equipment is adequate to provide temperatures ranging from 38° to minus 30° F.

New Gas Processing Plant

A new gas processing plant five miles north of Minneola, Kansas is being erected by Skelly Oil Company. Construction started last Fall, is scheduled for completion by March of this year. A refrigerated absorption system at 700 pounds working pressure will be installed in the new plant. Products produced and extracted from natural gas will consist of propane and a butane gasoline blend which will amount to about 15,000 gallons a day. These products will go to the Kansas Power and Light Co.

White Named President of IAICM Management Council

The Management Council of the International Association of Ice Cream Manufacturers elected Edward White, general manager of the Ice Cream Sales Department of H. P. Hood & Sons, Boston, Massachusetts, as its president during the recent IAICM convention in Chicago. Since 1958, when the Management Council was formed, Mr. White has served as 1st Vice President. He succeeds Mark Matthews of the Carnation Company, Los Angeles, Calif. Ed. White started with H. P. Hood & Sons immediately after his graduation from Dartmouth in 1938. He has served Hoods since that time with the exception of the period 1942-45 when he was a Lieutenant Senior Grade in the Navy Air Force.

Empire Refrigeration Supply Company To Move

Martin J. Roznowski, president of the Empire Refrigeration Supply Company, oldest wholesale refrigeration supply house in Central New York State and presently at 415 East Jefferson Street, Syracuse 2, N. Y., announces that construction of their new, larger salesroom-warehouse with improved parking and loading facilities is now under way at 310 Irving Avenue in Syracuse and will be ready for occupancy sometime in the Spring of 1961.

Odor Transfer in the Storage of Frozen Foods

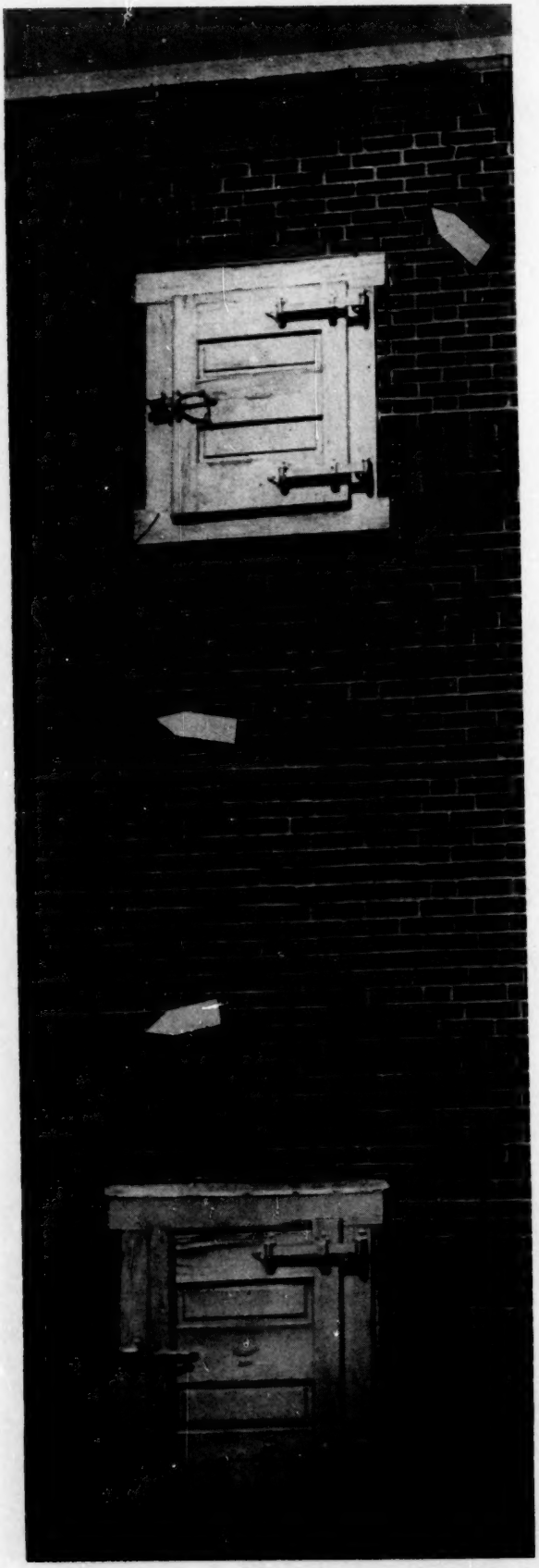
Transfer of odor from one frozen food to another is eliminated by proper packaging according to a research report by Dr. E. A. Fieger and A. F. Novak of the Department of Agricultural Chemistry and Biochemistry, Louisiana State University. Deep fat fried chicken and butter were packaged in several ways, frozen and stored in the same area as fish. Samples were removed for odor and flavor tests approximately every six months during a 3-year period. Products heat-sealed in Mylar bags or overwrapped with heatsealed cellophane bags came out of 35 months storage without odor, while butter without these sealed wrappings had a distinct odor.

Program Announced For 1961 Temperature Symposium

The technical program is now complete for the most comprehensive meeting ever held on the subject of temperature measurement. About 200 papers will cover temperature measurements from absolute zero to 10,000,000° K with interests ranging from the temperature of the human body to the temperature of the sun. Almost every area of the physical biological, and medical sciences will be represented at the 1961 Symposium on "Temperature, Its Measurement and Control in Science and Industry," to be held in Columbus, Ohio, March 27-31, 1961. The conference is sponsored by the American Institute of Physics, the Instrument Society of America, and the National Bureau of Standards.

Problems In

By ALAN R. McGARVEY, Manager
Industrial Insulation Research
Armstrong Cork Company



The insulation contractor has a great many pitfalls strewn in his path in constructing cold storage rooms. Of the many items that have to be given careful engineering consideration in order to provide a successful job, 20 have been selected as the most important. Lack of proper attention to any one can result in problems ranging from minor irritations to major failures. The 20 items, not necessarily in order of importance are:

1. **Proper building design for strength.**
2. **Column details for heat loss.**
3. **Ventilation under freezer floors.**
4. **Through flashing at parapet walls.**
5. **Water tight masonry construction.**
6. **Heat leaks through insulation.**
7. **Large roof areas–expansion joints.**
8. **Blower locations–ceiling protection.**
9. **Reinforce free-standing walls.**
10. **Proper door buck design .**
11. **Ledger strips for high masonry walls.**
12. **Selection of proper insulation.**
13. **Specification and attention to details.**
14. **Warm side vapor and air barrier.**
15. **Breaks through vapor barrier.**
16. **Proper conduit design.**
17. **Wall-ceiling juncture.**
18. **Tight fit of insulation.**
19. **Proper insulation thickness.**
20. **Proper finish.**

Fig. 1—One wall of a 3-story warehouse cracked and bulged by frost heaving. Arrows follow path of crack.

Building Cold Storage Rooms

»» IN AN actual case study of a cold storage warehouse, it was clearly shown how improper attention to a number of items caused a variety of serious defects. Many of the defects were caused by lack of ventilation below the freezer floors. To understand the trouble that can be caused, remember the basic fundamental fact that insulation merely slows down the passage of heat and does not stop it. Insulation is not an impenetrable wall over which the units of heat cannot climb but acts as a barbed wire entanglement that slows down the units of heat sufficiently so that the refrigeration system can cope with them.

Another fact to keep in mind is that the ground is a huge reservoir and insulator at or about 50°F. waiting to release its hoard of Btu's to any lower temperature items placed in contact with it. As Btu's are released, the temperature drops. If the release is rapid enough, or over a long enough period of time, the ground temperature slowly drops until it is at or below freezing. Any moisture present naturally freezes into ice, expands during the process exerting tremendous forces which can heave a floor or raise building columns. In areas 20 feet x 20 feet or smaller, this phenomena does not usually occur because of the supply of Btu's available around the outside of the freezer area. In larger areas, if additional Btu's are not supplied by some mechanical means, floor heaving can almost be guaranteed.

In the three-story warehouse under discussion, a crack was clearly visible in the wall. (Fig. 1). Not only was the concrete coping displaced as shown in the photograph, but a bulge also existed in the wall. The extent of the bulge is shown in Fig. 2.

Heaving of a building column caused humps in the roof (Fig. 3.). Fig. 4 shows how far the wall had separated from the third floor inside the structure and Fig. 5 shows the separation of the wall from the ends of the roof joists which were originally in contact with the wall.

Investigation showed that the building was originally designed for apple storage and there was no provision made for a freezer. Later, however, a freezer was built directly on grade enclosing several building columns, surrounded by coolers and no floor ventilation had been provided. Ice formations under this area had caused the floor and building columns to heave, resulting in the damage shown in the photographs.

Air Infiltration

Infiltration of moisture into cold storage rooms is perhaps the most noticeable and at the same time the most insidious cause of trouble. In many cases the results are apparent while in others, the trouble is there but not always discernible. The standard answer to moisture infiltration into cold rooms is vapor permeability due to inefficient vapor barriers or vapor barrier damage. This, however, is only part of the answer.

We all know that air pressure varies in proportion to height or distance away from the center of the earth. The higher one goes, the lower the pressure. A sensitive pressure indicator will show a change if it is moved from the floor to a table. In a room, therefore, there will normally be a difference in pressure between the floor level and the ceiling level. The air pressure at the floor is greater than the air pressure at the ceiling.

The difference in pressure is due entirely to the weight of a column of air the height of the room. When the temperature of air is lowered, as in a cold room, the density or weight per unit volume increases and the volume decreases. This means that the colder layers of air fall to the floor, tending to create less pressure or a partial vacuum near the ceiling. At the same time, the pressure near the floor increases due to the weight of the heavier column of cold air. Present day economic construction techniques obviate the possibility of building a room which is perfectly sealed to

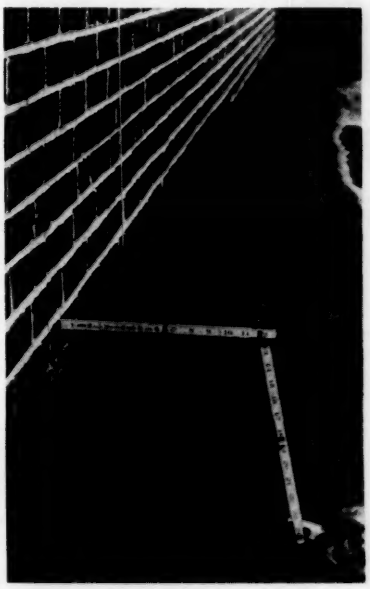


Fig. 2—Plumb line shows the extent of bulge which caused wall to crack. Note that wall has bulged 4 inches.

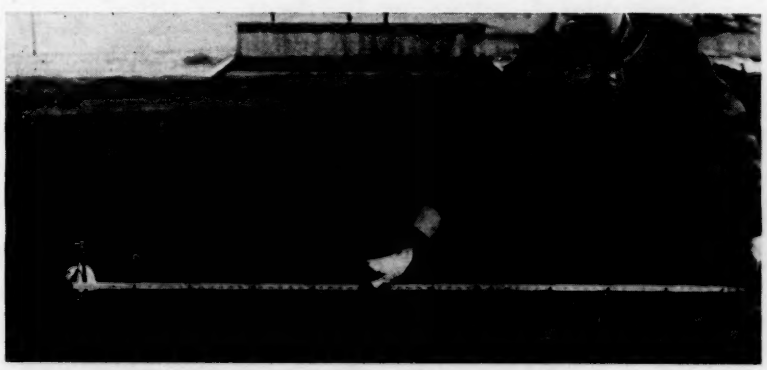


Fig. 3—Frost heaving of a building column caused this hump in the roof.

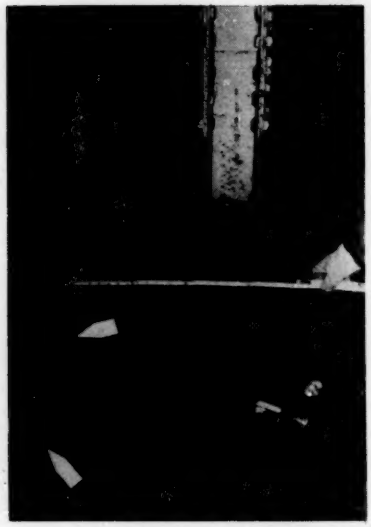


Fig. 4—Arrows point to separation of third floor and wall when the wall bulged due to frost heaving.

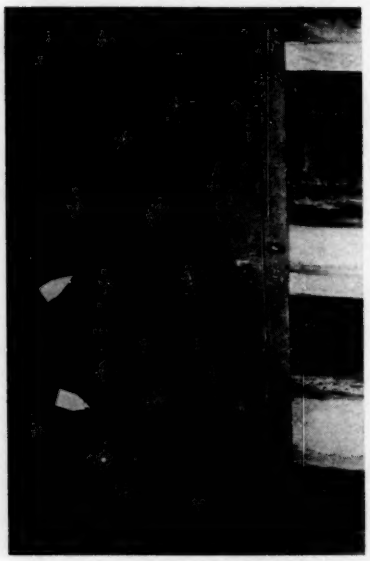


Fig. 5—Looking up at the ceiling, arrows point to separation of wall and ends of roof joints.

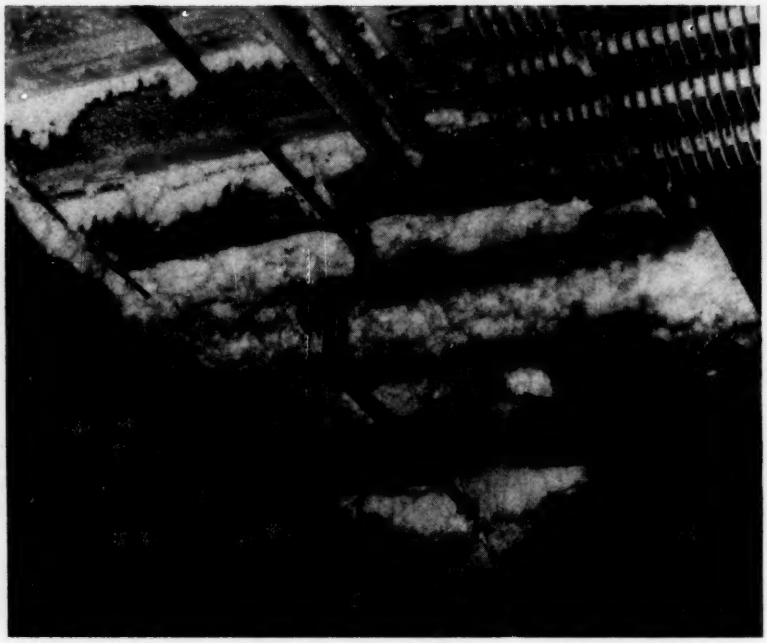


Fig. 6—Poor sealing of the wall-ceiling juncture in this freezer room permitted leaks of moisture and air. Note the formation of frost and ice due to the leaks.

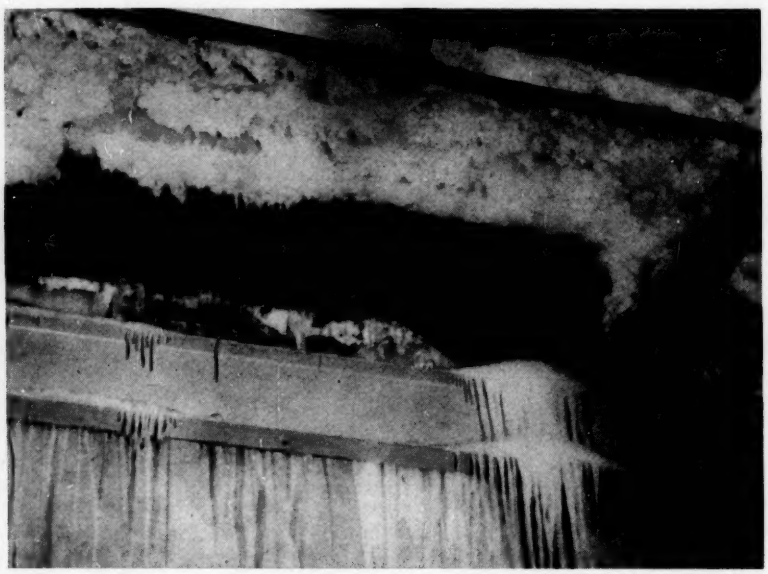


Fig. 7—Another area where poor sealing of wall-roof juncture and building movement results in air and moisture infiltration.

prevent air filtration. There is always some leakage.

Because of this, when a room is pulled down, static equilibrium is never realized but a sort of dynamic equilibrium takes place with more or less air movement through the walls and ceiling in both directions depending upon location. This has been called the "Reverse Stack Effect" which is in the exact opposite to what goes on in a chimney when the furnace is started.

Since nature does not relish conditions not in equilibrium, air wants to move into the cold room near the top of the wall because of the partial vacuum, and out at the bottom as a result of the higher pressure inside the room near the floor level. Evidence of this phenomena is clearly visible in many cold storage rooms.

Fig. 6 shows a deposition of frost and ice. Because of improper sealing of the wall-ceiling juncture in this freezer, moisture laden air has been drawn into the room and the moisture deposited as frost or ice. Note the frost around the improperly sealed sprinkler line where it enters the room.

Fig. 7 shows a close-up of another area where improper seals at the wall-roof juncture or building movement has resulted in air filtration at such a rate that the under-

Fig. 8—Defective gaskets around this door and door warpage causes leak at top of door.

Fig. 10—A clearly indicated leak through the insulation caused by improper sealing of pipes entering freezer.

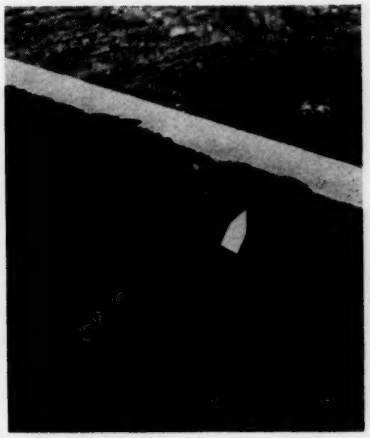


Fig. 12—Arrow points to defective counter-flashing at parapet wall of cold storage plant. Rain can enter here and seep down to insulation.

Fig. 9—Another example of leakage around a door. This one indicates considerable blast of air entering the storage room since no frost has formed at gasket line.

Fig. 11—Building movement and poor sealing at corners created this serious leak defined by the frost formation.

Fig. 13—A much more serious defect in counter-flashing at parapet wall. Here the broken flashing forms effective funnel to catch rain which will eventually reach insulation.

side of the ceiling (dark area) was kept warm enough to prevent freezing while over part of the area not even condensation occurred. Where condensation did occur, it dripped off the underside of the roof deck and formed icicles on the beam.

Fig. 8 shows a similar occurrence due to poor gasketing around a door or door warpage preventing the door from sealing against the gasket. Fig. 9 is a close-up indicating a considerable blast of air entering since no frost or ice has formed at the gasket line.

Typical of improper sealing of pipes and conduits entering freezers is shown in Fig. 10. A small leak has allowed moisture laden air to infiltrate into the room. The moisture has precipitated out to form ice and frost.

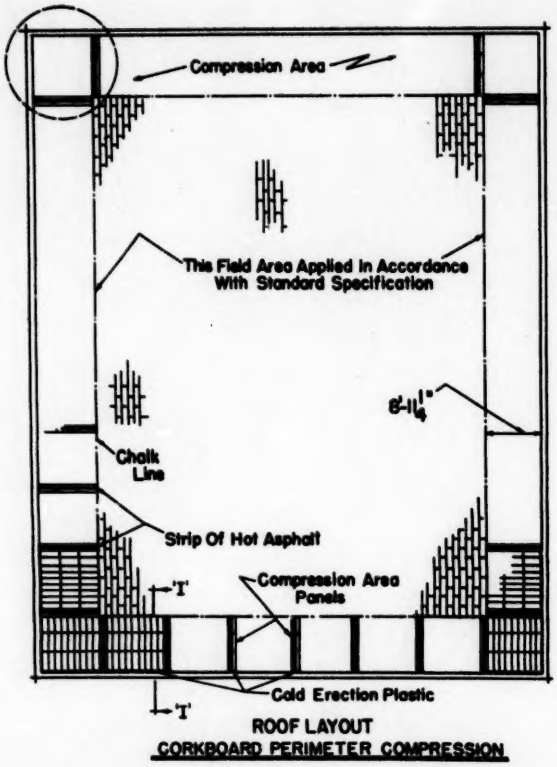
Another potential source of troubles resulting from improper sealing against air filtration or building movement is at corners of the rooms near the ceiling. Fig. 11 is typical. A study of this indicates a large amount of air filtration near the ceiling diminishing as it comes down the wall.

The examples illustrated indicate that this could not possibly be the result of inefficient vapor barriers alone since leakage through a vapor barrier would be slow enough to deposit moisture in some form within the insulation and not on cold surfaces within the room. The results are attributed solely to air infiltration resulting from lack of air barriers, breaks in vapor barriers, or building movement.

Fig. 14—Corners of concrete wall structure are broken in this photo due to wall movement and bulging.

Fig. 16—The first field strip of corkboard being applied to the roof.

Fig. 17—How the last two pieces of corkboard are installed under compression in the perimeter of the roof.



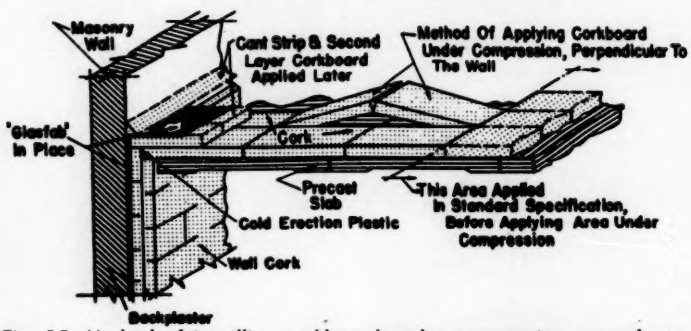

Masonry Wall
Cant Strip & Second Layer Corkboard Applied Later
Method Of Applying Corkboard Under Compression, Perpendicular To The Wall
'Glasfab' In Place
Cork
Precast Slab
This Area Applied In Standard Specification, Before Applying Area Under Compression
Cold Erection Plastic
Wall Cork
Backplaster

Fig. 15—Method of installing corkboard under compression around perimeter of the roof when the ceiling insulation of the freezer is also the roof insulation.

Turning to the outside of a building, Figs. 12 and 13 show the poor condition of the counterflashing along a parapet wall of a cold storage plant and Fig. 14 shows another trouble spot where walls join. Not only moisture laden air, but rain can also enter at some of these locations.

Prevention Of Trouble

Now that we have seen where some of these failures occur and why they have occurred, let us briefly examine ways and means of prevention. Since the basic step is to prevent air infiltration, the first concern is treatment of the walls. The majority of warehouse construction today is of masonry units which are porous. Because of this, back plaster should be applied to help seal the walls against air infiltration. A minimum of one-quarter inch over the high spots is recommended.

At inside wall corners a good asphalt-asbestos filled mastic reinforced with membrane should be carefully applied and allowed to dry thoroughly before installing the insulation. Most mastics of this type contain petroleum naphthas which could contaminate certain food products if covered over while still wet.

At the wall-ceiling juncture, simi-

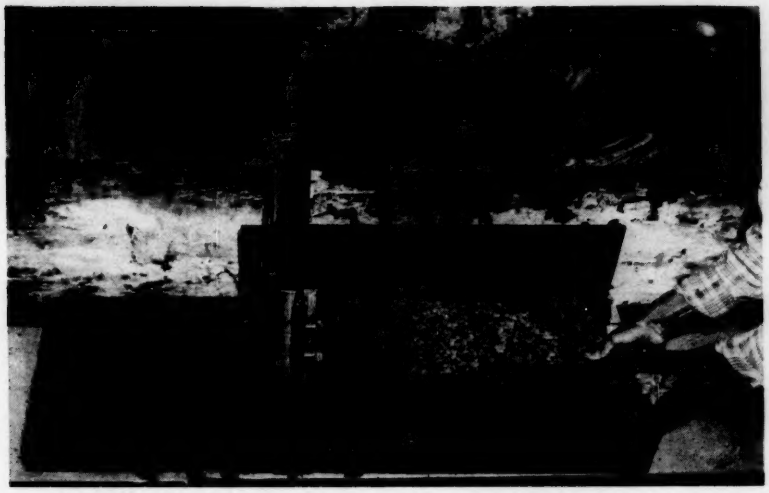


Fig. 18—Using the slush box or push box to apply adhesive to the corkboard before placing on roof.

Fig. 20—Thorough tuck-pointing around each corkboard is important in stopping air leakage. Photo illustrates method of sealing at these points.

lar reinforcing should be installed paying particular attention to the seal against the wall and over the top layer of ceiling insulation.

Where the ceiling insulation of freezers happens to be the roof insulation and envelope construction is used, a unique method of installing corkboard under compression around the perimeter of the roof has been devised as illustrated in Fig. 15. This method depends on the expansion of the compressed corkboard to compensate for contraction of the roof deck as the freezer is pulled down, reducing the tendency of the wall-roof juncture to open up. Note the use of the membrane reinforcing at the wall-roof juncture.

Fig. 16 shows the first field strip of corkboard being applied. Fig. 17 shows the last two pieces of corkboard being installed under compression in the perimeter.

From the examples previously given of the troubles possible because of frost heaving of floors and building columns in freezers built on grade, it is well to remember that subfloor ventilation or some other system of supplying heat is a prerequisite.

The use of polyethylene film between the floor insulation and the concrete subslab is also being widely used to prevent moisture migration into the floor insulation from the ground. A second layer of film between the floor insulation and

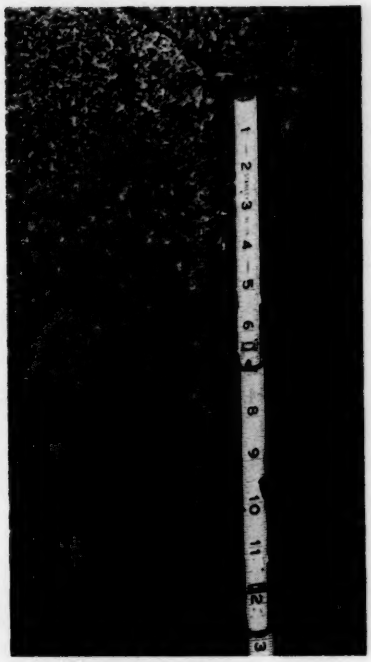


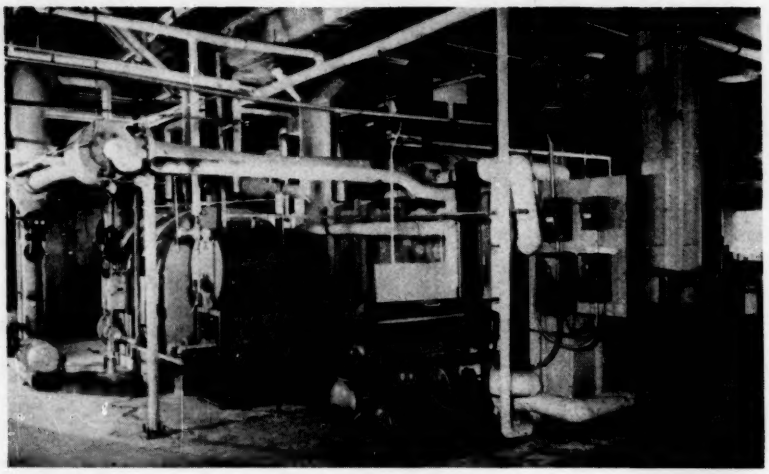
Fig. 19—Here is a wall that appeared to have high air infiltration. When the insulation was removed these gaps in the wall were found.

the concrete wearing floor is recommended to prevent excess water in the concrete from permeating the floor insulation and subsequently freezing when the room temperature is lowered.

The practice of using slush boxes or push boxes to apply adhesive, both asphaltic and Portland cement mortar, has become more and more universal. Fig. 18 shows a two-part asphaltic type adhesive being applied. Note that the leading edge of the board is not coated. This opens the possibility for not only vapor migration but also air infiltration.

Fig. 19 shows a wall which appeared to have an unusually high air infiltration. The insulation had been installed against a brick wall in Portland cement mortar using a push box. The insulation was later carefully removed from the wall and the photo taken to show the gaps between the mortar which went completely through to the brick wall.

It is vital that great care be taken to assure complete coverage of the masonry wall with the adhesive. Fig. 20 illustrates proper pointing around each board to assure complete coverage of the masonry wall to prevent undue air filtration.



Refrigeration equipment and compressors used in U. S. Army Quartermaster depot freeze-dry installation.

Vacuum Freeze Dehydration Process Enters Market

New Equipment Brings Profit Possibility To Food Processing Operations In Freeze-Dry Method

By M. SCOTT CASSELL

Since our readers are vitally interested in the design, installation, operation and maintenance of refrigerating equipment, we felt that a search into this subject could turn up valued information. A Chicago manufacturer of the equipment gave us an enlightening discussion on the subject and, very kindly provided us with the accompanying illustrations for our article. We would suggest that our readers check into the possibilities of refrigeration equipment profit in this new phase of food processing.

Installation showing two vacuum freeze dehydration cabinets in U. S. Army Quartermaster depot operation.

»» FOR some time we have heard the value and virtues of dehydration extolled by experts in the field as an answer to transport and storage of processed food items. A size and weight reduction is vitally important in any transportation or storage activity, and this is even more true in speaking of foods than of other products because of the inherent requirement of refrigeration.

Refrigeration engineers have searched for an adequate dehydration system for a long time—and, with the introduction recently of a new type of equipment, have seemingly found the answer in a freeze-dry method of dehydration. A previous objection to dehydro-frozen foods was the high remaining moisture content which, even with 50% of the moisture removed, still required refrigeration during shipment and storage. The new process can remove practically 100% of the moisture under vacuum while frozen and still retain the flavor and freshness for later rehydration according to A. Lederman, president of Vacudyne Corporation in Chicago, one of the firms which designs, fabricates and installs the new equipment.

Refrigeration Equipment Required

Mr. Lederman explained that his company, had gone into extensive research while developing their system, and as a result, have built into the equipment several innovations which overcome most previous objections to dehydrated food items. He pointed out that the freeze-dry system does not replace refrigeration at any time other than during shipping and storage periods, which should benefit food processors and warehousers without subtracting essentially from the refrigeration industry since this new method also requires refrigerating equipment.

In describing the new freeze-dry system, the company president showed how a one ton, two-stage direct expansion refrigeration system is used to freeze the product, and a vacuum is used to remove sublimated ice (in vapor form). Then the dehydrated product (with moisture removed) is transferred to a polyethylene bag or canned for storage. Some items, Mr. Lederman claimed, have been thus stored for

more than a year, then rehydrated and served without losing a bit of the original flavor.

Slow De-Icing Prevents Brittleness

Becoming a bit more technical, Mr. Lederman showed a diagram, that takes a lot of the mystery out of the method. The product is frozen in either a raw or pre-cooked state. In a conventional freezer, or more recently, in a blast freezer, it is frozen to at least -20° F. To prevent coarse texture and improve rehydration, the rate of initial freezing must be carefully controlled.

Then, the cabinet is subjected to an approximate 100 Micron vacuum which draws off the moisture of the product as vapor, leaving a rigid porous product approximately 95% solid. The moisture passes through a cold trap and the air passes into the vacuum pumps for discharge. When the product has been dried, the vacuum is released and the product is then packaged and restored to room temperature.

Rehydration is accomplished, at the time the product is to be served, by briefly subjecting it to a boiling water bath, and then preparing it for serving in one of the many tasty recipes which tickle our palates every day.

Large Scale Program For Army

As one example of an installation and its operation, the U.S. Army Quartermaster Corps has placed a unit in operation. The problem of supply and logistics has long been troublesome to military activities in feeding their men. The freeze-dry system may well prove to be the

Continued on page 18

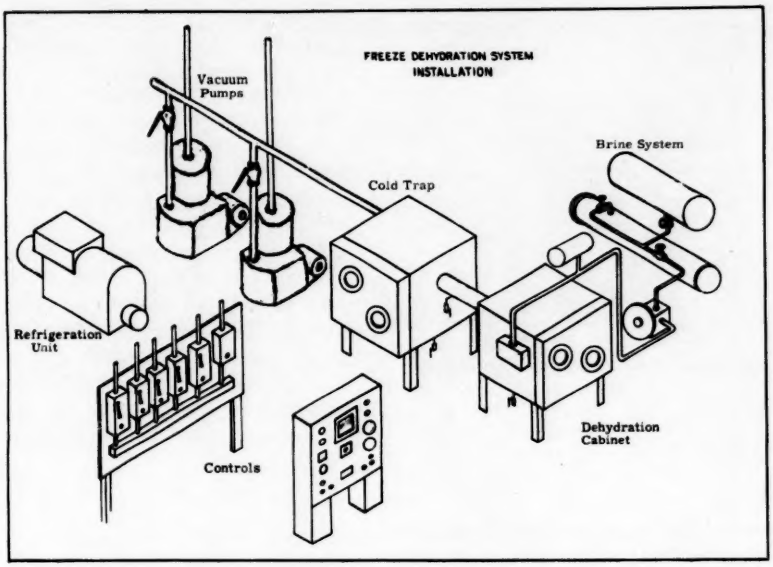


Diagram of one ton, two-stage refrigeration system used with vacuum equipment to freeze-dry products in Canadian laboratory working on defense research.

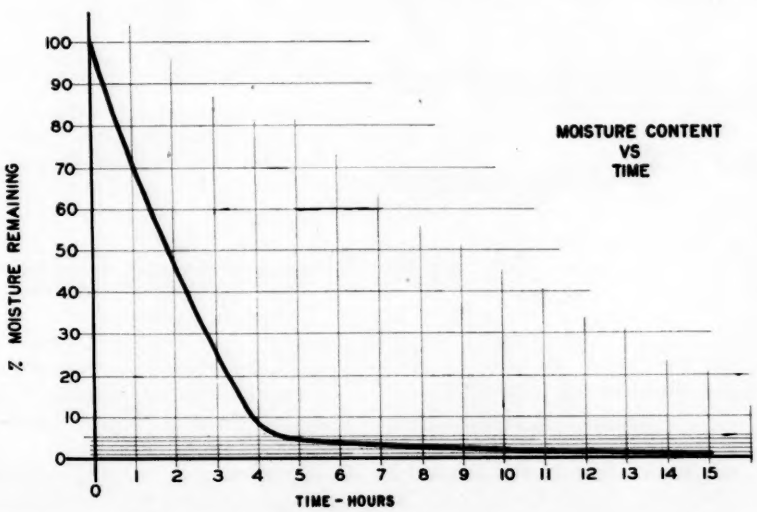
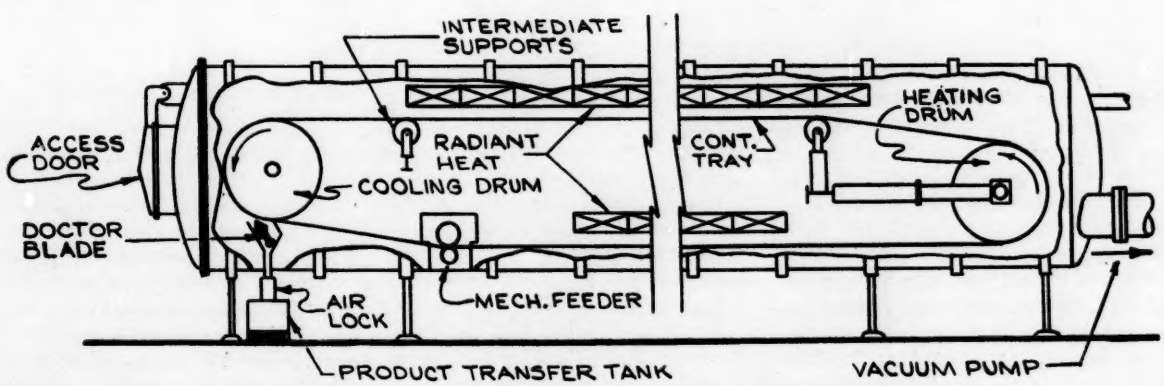


Chart showing time required in freeze-dry system for amount of moisture to be removed from product.



Operation diagram showing latest Vacudyne development in freeze-dry systems.

By ROBERT SHERIDAN
Nationwide Leasing Company
Chicago

How Does Leasing Equipment Compare With Purchasing?

EQUIPMENT leasing is developing into an important new way for industry to acquire new equipment, especially refrigeration equipment. Production equipment on lease to American industry at the end of 1959 reached a total volume of $307 million. Of this, approximately $8.7 million was refrigeration equipment of all types. This was a gain of about 47 per cent over 1958. A number of major manufacturers, such as the York Corporation, Typhoon, and others have successful lease plans in operation.

This boom in equipment leasing is not the result of a short-lived fad. Through leasing, a company is supplied with additional capital in the form of machinery and equipment, while its own cash is left free to work in the business. More working capital plus newest equipment plus certain tax-timing advantages add up to additional growth plus additional profits. The growing realization that equipment leasing offers such benefits goes far to explain the boom in this field.

While leasing was originally a big business idea brought in during World War II, it soon spread to smaller and medium-sized businesses. In addition to larger profits, smaller companies found that leasing was a sort of "equalizer" which tends to help smaller firms compete with larger ones. Through leasing, smaller businessmen discovered that they, too, could avail themselves of the latest cost-saving equipment without depleting their working capital.

Businessmen lease equipment for one of several reasons:

1. Long-term financing is obtained without imparing a company's short-term credit position. Usually leasing offers longer terms than are available through other sources of funds. Since only the lease payments for the current year are shown on the balance sheet. (with the remainder footnoted), current ratios are only slightly affected. Thus companies have found that they can use short-term borrowing for current needs, while using long-term leasing to acquire the use of equipment.
2. The cost of equipment is paid out of earnings made during its use.
3. Leasing charges are legitimately deductible as operating expenses. This permits companies (a) to write off the cost of equipment more realistically, and (b) to replace equipment when business economics demand it.
4. Long-term financing is obtained through leasing without diluting the equity of owners or stockholders, interference with management.
5. Companies can obtain through leasing the precise amount of financing needed (in the form of equipment). Thus a large company needing, for example, $521,658 worth of equipment would find it preferable to lease equipment rather than resorting to the bond market or an issue of stock in that odd amount. The example of the city of Boston may prove valuable to businessmen. The city recently announced that it had saved 23 per cent of its interest costs by financing precise sums as they were needed, rather than larger round sums.
6. Leasing protects a firm against possible early obsolescence of equipment. If technical advances make it nessesary to scrap machinery in seven years, for example, the company will have already deducted the full cost of the machinery.

The questions most businessmen ask about leasing are mainly these: (1) does it actually work, and (2) how does it compare in cost with other methods of acquiring equipment?

The answers to these questions are well illustrated by the situation of a medium-sized Arkansas food processor, who recently leased equipment worth approximately $60,000. Included were packing equipment, refrigeration equipment, office machines, and other equipment.

The firm was in a position to obtain this $60,000 of equipment in any way it chose: it could purchase for cash, it could obtain an installment bank loan to finance the equipment purchase, it could buy through conditional sales contract, or it could lease the equipment. Why it chose leasing is, of course, the point of this story.

On a comparison of the real costs involved, leasing offered this firm the greatest potential profit. This may not be true for all companies, but it is certainly true for many.

Leasing vs. Cash Purchase

This client is a soundly-run firm with sufficient liquid capital on hand to take $60,000 out of its working funds to buy this amount of equipment outright. The company is also a profitable one, with its sales volume expanding yearly. Its rate of profit on *working capital before taxes* is 31 per cent. This is just below the average for all industry, which is 37 per cent. The company was interested in keeping

its working capital intact in order to earn the greatest potential profit. However, the company was willing to consider alternative methods of acquiring equipment. Actually, whichever method yielded the company the greatest net profit would be most desirable.

Terms for purchase were cash, net 30 days; depreciation method used by the firm is sum-of-the-digits. The lease plan covered a 10-year period, which is the average of the estimated useful life of the different pieces of equipment. It was broken into a three-year original lease term and seven one-year renewals. In the three-year original lease term the company paid the original price of the equipment ($60,000) plus a small leasing charge. The seven one-year renewals were at the rate of 5 per cent of the original purchase price of the equipment, or $3,000 a year.

How Leasing Works

A company wishing to lease equipment contacts a leasing firm and submits an application describing itself, its financial position, and naming the equipment it wishes to obtain. The company selects the supplier it wishes and arranges whatever price it can negotiate.

If the company qualifies, the process of delivering the equipment starts the day the papers are signed. Lease payments start when the equipment has been delivered.

Length of terms

Leasing is long-term. Normally it ranges from three to 10 years, depending on the company and the size of the lease. Most leases fall between three and five years. Payments can be either equal monthly payments or tailored to any preference of the user and adjusted to any accounting system. Renewal options are available for one or more years.

The cost is the original price of the equipment, plus a small leasing charge. The entire cost is paid in the original leasing term. Renewal options are standard and are available at very low cost.

Types of equipment

All types of equipment can be leased under a single master lease and covered by a single monthly lease payment.

Purchase options

Purchase options are available, but not recommended, according to Nationwide Leasing Company. The reason is that purchase options can be interpreted by the Internal Revenue Department as converting a leasing agreement into a conditional sales contract. The effect of such an interpretation is to cost the user the benefit of deducting his full leasing charges as an operating expense.

Analysis of Profits

The company's accountant then undertook an analysis to determine whether the greater total cash outlay under the lease plan (over the 10-year period) was offset by the profits earned on the working capital left free to work in the business.

(An objective study, including voluminous tables, covering this and other aspects of equipment leasing, has been published by the Foundation for Management Research. It is entitled: "The Pros and Cons of Leasing." Single free copies are available to executives by writing to the Foundation at 121 West Adams Street, Chicago 3, Illinois.)

Starting point of the analysis was the larger cash flow generated by the working capital retained in the business because of leasing. In the first year this amounted (in round numbers) to about $42,000. This cash excess recurred in smaller amounts in succeeding years and in the later years of the lease was replaced with a cash deficit.

Projecting these figures over the 10-year period, the company calculated the net profits it would earn by putting to work the additional working capital made available to it through leasing. The company also calculated the cumulative net profits earned on the cash excess and the after-tax retained net profits (which were added to the cash excess). Basis for the calculation was the company's average net profit *on working capital*, using the average of the previous five years. As mentioned above, this was 31 per cent before taxes, or about 15 per cent after taxes.

The outcome was that by leasing the equipment, instead of purchasing it for cash, the company would find itself about $30,000 ahead (in round numbers) in cumulative net profits after taxes at the end of the 10-year period of the lease. This is 50 per cent of the original price of the equipment.

There is nothing mysterious in this, even though at first glance it seems fantastic that, after paying for equipment for 10 years a firm would wind up with cash equal to half the original cost of the equipment. Nor is this the result of mathematical sleight-of-hand. It reflects a simple fact: when a company (any company) takes $60,000 (or any sum) out of its working capital and freezes it in equipment, the company gives up exactly the amount of profit the frozen capital would earn if used in the business. For the typical firm, where working capital can earn profits at a favorable rate this can come to a hefty sum over a 10-year period.

(The precise way in which this startling result occurs is explained in detail in the study developed by the Foundation for Management Research, cited above.)

All this is a simple, practical demonstration of a long-known principle of economics: profits are earned by the *use* of assets, not the ownership of them.

Leasing vs. Installment Purchase

Now cash purchase is not as common among medium and smaller manufacturers as among larger ones. More usual is purchase on conditional sales contract. This was also open to the client. Terms were fairly typical: 25 per cent down payment with three years to pay the balance, with a financing rate of 6 per cent per year on the original $45,000 balance.

The same kind of financial projection was made as in considering cash purchase vs. leasing. Conlcusion: if the equipment were leased, at the end of the 10-year period the company would be approximately $19,000 ahead in greater cumulative net profits than if it bought the equipment on condi-

tional sales contract. This $19,000 represents 31 per cent of the original price of the equipment.

To repeat, the "magic" lies in the way leasing permits working capital to stay in the business and earn profits.

Leasing vs. Bank-Financed Purchase

So far we have found that the client, after deducting all costs, could realize greater profits through either cash purchase or installment purchase of the same equipment. The final alternative available is purchase through a bank loan.

Banks are essential to all businesses, but in making equipment loans, banks almost never lend 100 per cent of the value of the equipment. At best, a bank will lend only 75 per cent of the value of the equipment—assuming that the equipment is a common variety of saleable machinery. Banks do not like to lend money on special equipment which has only a limited resale market, whereas Nationwide Leasing Company will lease any type of tailor-made equipment.

Also, banks cast a jaundiced eye on applications for long-term (more than one year) loans to acquire equipment. Only a small portion of a firm's borrowing from its banks can consist of long-term equipment loans. Finally, businessmen who believe that the rate on a 36-month chattel mortgage on equipment is the same rate as a 90-day note have not been active in the money market.

This aside, the client was in a position to obtain bank financing for his equipment purchase, covering 75 per cent of the value of the equipment; 25 per cent had to come out of his working capital. Finance rate was 5 per cent of the original balance for three years. Using the same calculations made above, the company found that at the end of 10 years it would be about $17,000 ahead in greater cumulative net profits after taxes, if it leased the equipment instead of buying through bank financing. This was 28 per cent of the original cost of the equipment.

In summary, the client found that by leasing his $60,000 worth of equipment he would be about $30,000 ahead in net profits as against outright cash purchase; about $19,000 ahead in net profits over installment purchase; and about $17,000 ahead in net profits over purchase through bank financing.

In addition to this single benefit of lower net cost through leasing, this company obtained other benefits, which are inherent in any leasing transaction:

1. The company's short-term credit position was not impared by leasing. Only the lease payments for the current year are shown on the balance sheet as a liability, with the remainder footnoted. This is the proper accounting procedure.
2. The cost of the equipment will actually be paid out of earnings made during its use.
3. The leasing charges are legitimately deductible as operating expenses.

However, it should be said at this point that equipment leasing is not all beer and skittles. It is not the sovereign balm or the cure-all remedy for ailments of business. There is one major factor cited as the main disadvantage of leasing: at the end of the lease term a company does not own the equipment.

This is a fact. Whether it is a disadvantage, however, depends on actual cases. We have just seen one case where *not owning* was an advantage. This is because the company earned more profits through not owning than by owning its equipment. In all cases, where not owning will yield greater profits than owning, leasing is an advantage.

Not owning the equipment at the end of the lease term is a disadvantage only under one possibility: if the used equipment at the end of the lease is worth more than the additional profits earned as a result of leasing. This is a simple test and one which can generally be calculated without too much difficulty. Normally, because of the rate of obsolescence this is not the case.

Thus, to take the example we have just analyzed, is it likely that at the end of 10 years the equipment would be worth 50, 31, or 28 per cent of the original cost? Hardly. The experience of most companies in all industries bears this out.

There are three types of companies which will *not* find leasing advantageous.

1. The company which has all the working capital it needs, and which does not require any newer equipment. For such a company it would be foolish to pay a leasing company for use of capital (in the form of equipment) if neither the capital nor the equipment is needed.
2. Companies which earn less than 10 per cent on working capital, *before taxes*, should not lease. Incidentally, this is not 10 per cent on total investment. This is 10 per cent on working capital *before taxes*, or less than 4.8 per cent on working capital *after taxes*. It doesn't pay for such a company to pay a leasing firm for use of outside capital.
3. Finally, marginal companies shouldn't lease. No leasing company will lease equipment to any company if the value of the equipment is greater than (at most) 50 per cent of the companies net worth. This is a rule of thumb, but fairly accurate.

Within these limits, leasing has blossomed all over the map, and for many companies leasing has provided a golden opportunity to spurt ahead in sales and profits.

Freeze-Drying

Continued from page 15

answer. Food and Container Institute officials in the Chicago Headquarters of the Quartermaster Corps, expressed satisfaction with the system, the equipment and its results. Steaks, pork chops, chicken, shrimp, fish, lima beans and chilli con carne have all been freeze-dried successfully; additional foods are still to be tested, and are expected to be equally acceptable to the military food requirements.

In another case, the vacuum freeze dehydration process has been under test in defense research as a means of survival food supply in air-raid shelters. Meat packers are also finding the system advantageous, as are food processors, canners and packagers of frozen foods.

A brand new idea in freeze-dry units, designed by Vacudyne Corporation for processing larger quantities of items in a shorter time cycle was announced by Mr. Lederman. As the illustration indicates, the new unit is based on the endless belt principle; with the products to be freeze-dried placed in containers, which move through a temperature controlled area under vacuum. This unit was designed in answer to inquiries from several of the larger food processors who were thinking in terms of freeze-drying in large volume. An interesting feature of the refrigeration system included a large condenser that utilizes direct expansion—but is so large that continuous ice removal was provided in order to avoid down time for defrosting.

Why Centrifugal Compressors Need Water Cooled Condensers

QUESTION: An interesting and informative article on evaporative condensers and water cooled condensers in the December issue states "A centrifugal compressor always requires a water cooled condenser".

Is this because of the kind of refrigerant used or because of the large size of these units? I would like to know more about this subject.

I have been of the opinion that in a locality where high temperatures, high humidity and bad water conditions exist that the evaporative condenser is the best answer. I have worked on large tonnages in a very bad locality for four years. Water cooled condensers all had to be replaced with home made coils installed in the cooling towers, because the water cooled condensers failed in three months or less.—C.E.C.

ANSWER: Evaporative condensers are available and listed in catalogs in capacities in excess of two hundred tons. However, they are not used with centrifugal compressors because the refrigerant normally employed will not tolerate pressure losses without excessive losses in capacity and efficiency. A casual observation will show that all refrigerant lines for centrifugal applications are considerably larger than the same lines on conventional Refrigerant 12 and Refrigerant 22 systems. These centrifugal compressor lines have been generously sized to reduce friction as much as possible. It is readily apparent that the tube bundle for an evaporative condenser has considerably more resistance to refrigerant flow than a water cooled condenser. This is because the refrigerant path is longer and has a smaller diameter.

Ambient air dry bulb temperature has for all practical purposes no effect on either an evaporative condenser or a water cooled condenser during the on cycle. Ambient air temperature will affect the starting cycle for such applications as night clubs where the sump water has not been recirculated for a prolonged period or has been exposed to direct sunlight.

The wet bulb condition of the air at a given time and the quality of equipment determines the equivalent condensing pressure regardless of the type of condensing employed.

The water on either type of equipment is generally cooled to within 7° F of the wet bulb. On the best quality equipment an approach to wet bulb of 5°F and better can be obtained while on economy type of equipment about 10° F approach is the best approach that can be realized. The same laws of adiabatic cooling apply in each case. The same laws of chemistry also apply. Hence, the same amount of chemicals will be deposited regardless of the method used.

It is time the myth about less scale on an evaporative condenser in identical waters and operating conditions was disspelled. In the August issue of INDUSTRIAL REFRIGERATION we discussed one of the reasons for this apparent misconception.

There are two current practices in the industry which may account for this illogical conclusion which were not discussed.

Manufacturers of evaporative condensers must make provisions for bleed on their units before they can meet the *Standards* of the Air Conditioning and Refrigeration Institute. Almost all manufacturers voluntarily conform to these *Standards.*

As the water circuits on evaporative condensers are usually assembled at the factory with the bleed incorporated as an integral internal feature, many operating and maintenance personnel are not aware of it. Cooling towers have no built-in bleed, and provision must be made on the site to obtain the necessary bleed. Often, this is never accomplished. Water cooled condensers are highly competitive items. As a result manufacturers design them with little or no safety factor. The safety criterion is expressed in terms of fouling factor. Many manufacturers rate their units on the basis of 0.0005.

Some few rate on chemically cleaned tubes. These manufacturers generally do not bother to indicate the scaling factor. The lowest possible fouling factor that should be considered for good water (under 50 ppm of hardness) which is recirculated is 0.001.

Harder waters should have fouling factors of 0.002 or 0.003. Government specifications generally never delineate what fouling factors are desired, and consequently, the units supplied have no safety factor. Water cooled condensers do require cleaning oftener than evaporative condensers because of less heat exchange surface exposed. Buying new and replacement condensers with high fouling factors will reduce the frequency of cleaning required. Adequate bleed will reduce the cleaning cycle. In some cases both bleed and chemical treatment will be required.

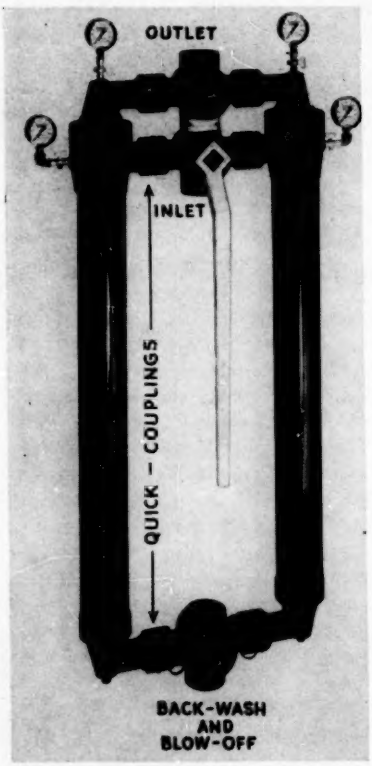
In tropical islands and coastal areas where there is little difference (say 7° F) in dry and wet bulb conditions, air cooled condensers are advantageous on smaller systems. However, evaporative condensers would not be suitable for centrifugal compressors even in these locations because of the pressure loss with resultant large losses in capacity and efficiency. Air cooled condensers have found wide Air Force application in the islands of the Caribbean and on the Texas

coast where the water is not only scarce but highly aggressive.

You did not mention the pH of the water used or the chemical analysis. What is considered bad water in one locality is often considered good in another. Bleeding of water may be the solution to your problem or chemical treatment may be desirable.

Fluid Filter and Strainer

RONNINGEN-PETTER Company has a new line of double Duo fluid filter units, with reducing streamlined smooth flow, 3 way inlet, outlet, and backwash blow-down valves.



Each filter has inlet and outlet gauges to record pressure differential. Two filters are mounted together with reducing streamlined 3 way valves to make one DUO. Filters may operate together or alone, and may be backwashed and blown down on the run. All of these filters are quick coupling.

These filters are used for clarification of any fluid containing foreign particles in suspension, such as dirty water, syrup or sugar solutions, hot lard, viscous liquids, chemicals or oils, fluids with pipe scale or iron particles.

Greeting "Man of the Year"

Dr. H. C. "Dutch" Diehl, recipient of the Frozen Food "Man of the Year" award at the Frozen Food Association of Delaware Valley Annual Award Dinner, November 21, is welcomed on his arrival in Philadelphia from his Colorado Springs headquarters, by William Spence, American Stores Company with placard-bearers (l. to r.) William Spigler, executive secretary, Robert Seymour, A. R. Wagner Company, Robert McKenna, Philadelphia Bulletin, and Murray Reidel, Grand Duchess Steaks.

»» DR. H. C. DIEHL, chairman of the Frozen Food All-Industry Coordinating Committee. was named the "Man of the Year" at the Annual Award Dinner of the Frozen Food Association of Delaware Valley, November 21.

Dr. Diehl, a veteran of thirty-five years in the refrigeration, warehousing, and frozen food industries, addressed eighty-five frozen food executives in a "Progress Report" of the Committee, jointly sponsored by ten associations vitally concerned with frozen foods.

Reports Progress

The FFAICC, according to Dr. Diehl, has in recent weeks strengthened its position in cooperating with the Government's AFDOUS Sub-Committee on regulations for frozen food handling and processing, with tacit support from the National Food Brokers Association, the Association of American Railroads, and other interested leaders in the retail grocers and chain grocery field.

The "Man of the Year" plaque was presented to Dr. Diehl by William Spence (American Stores Company), president of the Delaware Valley Association, and William J. Clements (Birds Eye), board chairman of the Association, after Dr. Diehl was introduced by Harry K. Schauffler, executive director of the National Frozen Food Association, one of the All-Industry Committee sponsors.

Challenge To Be Met

Dr. Diehl, in charging the members of the three-state group in Philadelphia with a burden of responsibility to cooperate with the All-Industry Committee, said, "Make it a personal and organizational project to meet the challenge of growth for your industry by correcting any and all violations of good handling practice with common sense measures, and cooperate with your local and state agencies. A state committee has been named for each of the fifty states to alert FFAICC on all regulatory or legislative measures brought before governing bodies, and to perform in the area of education to all segments of the Frozen Food Industry."

In concluding his remarks, Dr. Diehl said, "We will never capture the potential of Frozen Foods if we continue to perform as we have over the last ten years. Either we protect our good quality ourselves, or be compelled to do so by government edict."

USDA Lab Hosts Frozen Food Technical Conference

»» RESULTS of USDA's elaborate 10-year researches on frozen food quality were reported and discussed November 4 and 5 in Albany, Calif. at a meeting of industrial and public health groups concerned with frozen food handling standards.

The groups are the Frozen Foods All Industry Coordinating Committee (FFAICC) and the Canned, Frozen, and Processed Foods Committee and other members of the Association of Food and Drug Officials of the United States (AFDOUS).

These groups are working on codes designed to standardize and improve handling practices in the frozen foods industries, including packing, transport, warehousing, distribution, and retail selling.

The research reported was the widely known time-temperature-tolerance (T-T-T) studies conducted by USDA's Western Regional Research Laboratory. Because of the groups' interest in possible microbiological standards, two Laboratory staff men, Paul Elliott and David Michener, presented a specially prepared comprehensive review of technical literature on frozen food microbiology.

Dr. M. J. Copley, Director of the Western Laboratory, and W. F. Talburt, Assistant Director, said in opening remarks that the meeting was intended to aid both groups, since both are relying heavily on the facts from the T-T-T project.

The Laboratory's research reports centered attention on maintenance of quality as affected by the two inseparable factors, time and temperature. Dr. Hans Lineweaver discussed the critical problem of quality evaluation, using as a basic unit the amount of change a product has undergone when a trained panel of judges is first definitely able to distinguish it from an unaltered sample of the same product. This unit is not a measure of consumer acceptability, he said, but instead a definite and highly useful unit in measuring quality change.

D. G. Guadagni discussed ways to calculate the amount of quality change that results from various time and temperature experiences. Products vary, he said, in the rates at which their qualities change, but it is possible, from the comprehensive data of the T-T-T project, to calculate the effect on quality of time-temperature experiences, as in specific freezing, transfer, or transport operations. In a second report Mr. Guadagni discussed effects of time-temperature variables in freezing, again referring the effects to the unit of first distinguishable change in a quality.

A. D. Shepherd discussed variations among kinds of frozen food in quality stability as affected by temperature. In this report he brought extensive data from numerous products together in a compact useful comparison.

Robert L. Olson discussed objective tests—that is, those based on physical and chemical procedures rather than panels of judges. He discussed particularly the tests for chlorophyll and ascorbic acid retention and for loss of color.

Chairman for the FFAICC is Dr. H. C. Diehl of Trans-America Refrigerated Services, who is pres-

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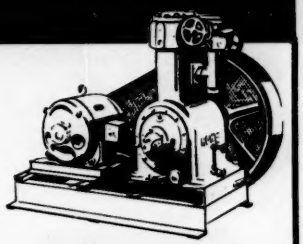

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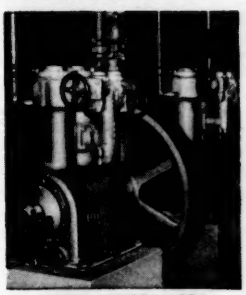

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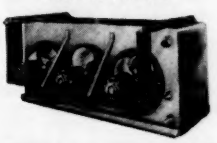

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ently devoting full time to the work of industry coordinating committees. M. P. Duffy, California Department of Public Health, and Harold Clark, Food and Drug Administrator, Hartford, Connecticut, are chairman and vice chairman of the AFDOUS committee which is considering frozen food handling practices.

In closing remarks these chairmen stressed the great value and significance of the meeting to the industry and the public—particularly because it brought together the two groups and because it consisted of comprehensive research reports and discussions of the two distinct phases of the problem, which are product quality and public health.

Included in the program was a discussion of new developments in refrigerated trucks by P. R. Achenbach, of National Bureau of Standards. He reported research on trailer performance conducted jointly by Agricultural Marketing Service of USDA, Truck-Trailer Manufacturers Association, QM Research and Engineering Command, American Trucking Association, and National Bureau of Standards.

Evan Wright, President of AFDOUS, was chairman of an afternoon session, consisting chiefly of a panel on industry problems, moderated by Dr. Cliff D. Carpenter, Consultant, Laguna Beach, Calif. Participants were Fred Otterbein, General Manager of Birdseye Division and Vice President of General Foods Corp., for the packers; Dr. Milton Ratner of Emery Transportation Co., Chicago, for truckers; Paul Burrill of Quincy Market Cold Storage and Warehousing Co., Boston, for warehousemen; Tom Kirk of Northern Frozen Foods, Inc., Cleveland, for distributors; and Lee D. Smith, Jewel Tea Co., Melrose Park, Ill., for retailers.

C. S. Brinsfield, Department of Public Health, Baltimore, and Dr. Walter A. Maclinn, Director of the Refrigeration Research Foundation were chairmen of two of the half-day sessions. L. L. Westling, Marine Refrigeration Specialist, presented remarks on marine transport of frozen foods. Dr. Emil Mrak, Chancellor of University of California at Davis, moderated a panel on microbiological standards.

The Status of Frozen Milk

»» THERE seems to be considerable controversy as to whether or not frozen milk and/or frozen concentrated milk will assume an important role in the food industry. The proponents believe these products can stabilize milk prices throughout the country, they are articles of commerce for export, and can be convenience items for local and national distribution . . . much like frozen steaks. The opponents generally ignore the possible export consideration and feel the present distribution system for fresh milk is economically sound and not soon to be replaced.

The Refrigeration Research Foundation reports that from a quality point of view, a review of the literature indicates that frozen milk and/or frozen concentrated milk are not yet completely satisfactory as an alternative to fresh milk. Freezing of milk by ordinary techniques results in a product that when thawed, separates into a somewhat "curdled" appearance, some of the minerals and sugars settle, and the flavor is watery and sometimes "off-flavored."

Many techniques have been tried to prevent the separation and settling. None have been completely satisfactory. Homogenization is not satisfactory. Sugar and other additives have been tried and help improve stability, but the flavor is altered. Rapid freezing, using liquid nitrogen, is reported to result in a less stable product than ordinary freezing temperatures. The use of sound waves of certain frequencies to bombard the milk is reported to have a stabilizing effect, but not all scientists concur in the efficacy of the procedure.

Professor R. Davidov of the Moscow Agricultural Academy, in the Russian journal "Refrigeration Technique" for May/June of 1960, reports a series of interesting experiments to prevent separating and settling of the components of frozen milk. (An English translation of this Russian article is available from TRRF. for those who may wish to have it.) His conclusions are that milk frozen rapidly in thin blocks and held at a temperature of approximately -10°F., where 3% or less of the water is still unfrozen, will result in a good quality thawed product. He states "The relationships in the changes undergone by the milk in the process of freezing and storage are the same as those observed during drying at elevated temperatures." It is known that dried milk of low moisture content is more stable than that of high moisture content.

It is doubtful that, to date, research has revealed the best way to produce frozen milk and/or frozen milk concentrate, but the goal looks near. After that the question of its role in the food industry will be solved by experience.

Poultry Men's Fact Finding Conference Opens February 10

»» THE completion of modern, analytical "flight plans" is being pushed rapidly for the 1961 Fact Finding Conference which opens February 10 in Kansas City, Missouri, according to Harold M. Williams, president of the Institute of American Poultry Industries, sponsor of the event.

Built around a jet-age theme "New Departures in Marketing", 3 program "flights" and 4 special "flights" are scheduled for this 32nd annual three-day event, February 10-12, in the Municipal Auditorium. Nearly 4,000 businessmen and women from the poultry and egg industry are expected.

Set for the opening day is the keynote message built around the fact that marketing is the key to everything. Three vital subjects—"Is Packing for the Controlled Brand the Answer?" "How to Reduce New Produce Risk"; and "Is Merger into Larger Selling Organizations the Answer?"—will be discussed by top-notch marketing "flight captains."

On Saturday a new "crew" of experts will move into operation with attention devoted to financing problems. Conference-goers will get details on the Small Business Administration and on the Small Business Investment Corporation

and the role these organizations can play in the industry. There will be "thoughts on public financing" as a case history is presented, plus a discussion on factoring.

The Sunday program "flight" will headline a nationally known expert in foreign affairs who will discuss the role of the poultry and egg industry in maintaining a favorable balance in the export-import situation. Other top rated speakers will handle the highly controversial subjects of "farm surpluses—controls or adjustments?" and the "minimum wage for agriculture."

In addition to these three "New Departures in Marketing" flights, there will be a special "flight" on export marketing and a series of commodity "flights" one on eggs, broilers and on turkeys. These sessions will review the most current problems in each area and will feature dramatic presentations on the consumer information work and merchandising activities of the National Broiler Council, National Turkey Federation, and Poultry and Egg National Board.

The Municipal Auditorium's huge exhibition hall will house the Fact Finding Conference exhibits, which will be open throughout the three-day event. The four-acre display is the only one of its kind featuring a wide variety of services and equipment – from breeding stock to spices for prepared poultry, from feeds to consumer packages, from live coops to boning machines, from individual pieces of processing equipment to complete processing lines.

Information on hotel accommodations or other Fact Finding Conference details may be obtained from the Institute of American Poultry Industries, 67 East Madison Street, Chicago 2, Illinois.

Mendenhall Named Refrigerated Sales Manager

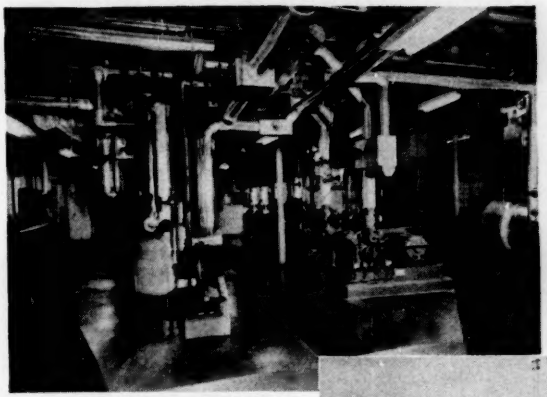
»» JAMES I. "Jimmie" Mendenhall, 38 year old trucking veteran, was recently named sales manager for Ringsby Refrigerated Truck Lines.

Announcement of the appointment of Mendenhall was made by Herbert N. "Herb" Grayson, general manager of the specialized division for the Denver-based transcontinental motor carrier.

Borden's New "Dairyland Showcase" plant relies on an all-Vilter Refrigeration System

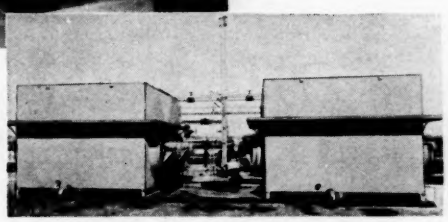
With 110,000 square feet of floor space, Borden's new $3,000,000 Milwaukee milk and ice cream plant is one of the most up-to-date and modern dairies ever built.

Borden's



Overall view of compressor room showing the six Vilter ammonia high-stage VMC compressors, Vilter brine cooler and liquid receiver. Five rotary booster compressors are installed in a line behind the intercooler.

View of the two Vilter VP350 evaporative condensers which handle the discharge from the compressors. A center partition in each unit provides an efficient means of reducing capacity and maintaining desired head pressure during cold weather.



500,000 quarts of milk a day! 5,000,000 gallons of ice cream a year!

These are the very imposing capacities of Borden's new Milwaukee milk and ice cream plant—the largest in Wisconsin.

An extensive all-Vilter system provides the refrigeration for the varied requirements of this plant. *Four* separate methods of refrigeration are employed—direct expansion, liquid recirculation, flooded and brine.

Borden's compressor room contains six Vilter ammonia VMC compressors and five boosters. A 42" x 10' Vilter intercooler is installed between the two stages. Handling the discharge are two Vilter VP350 evaporative condensers.

Each day the largest sweetwater tank installed in the state of Wisconsin chills 670,000 gallons of water to 33° which, in turn, holds the pasteurized milk storage tanks at 38°. Fifteen air units provide the refrigeration for the milk cooler, and forty-four truck charging positions accommodate the milk delivery fleet.

Other major Vilter equipment includes a hot gas defrost blast freezer for Borden's mammoth ice cream hardening room and a brine cooler for ice cream bar freezing.

All equipment selected by Borden was chosen to perform its job efficiently, quickly and insure the most sanitary, pure and wholesome products. Vilter is proud to play a part in this, Borden's "Dairyland Showcase."

Why not check with Vilter on your refrigeration problems?

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Write for your copy of bulletins covering above equipment to The Vilter Manufacturing Company, Dept. H-603 2217 South First Street Milwaukee 7, Wisconsin.

Liquid Nitrogen Cooling Of Air In Trucks

»»» THE USDA Agricultural Marketing Service has released a report on a test of a single frozen food distributing truck using liquid nitrogen to maintain the truck air at a low temperature.

A simple nitrogen spray system was installed in the truck. A single pipe ran along the ceiling from the front to the rear, from a main storage tank.

Liquid nitrogen was sprayed out of this pipe directly on the load. As it flashed into a gas it expanded about 700 times, forcing the warm air out of the truck and replacing it with cold, dry nitrogen.

Once the temperature was established, it was easily maintained, although the report does not indicate whether this was hand or thermostatically controlled.

The report does not indicate the air temperature of the truck nor the number of stops made, but during the five day test period the average temperature of the frozen foods when leaving the warehouse was 12°F and the average lading temperature at the last delivery was 9°F.

This they report is noticeably better than in trucks cooled by conventional methods, but it is not indicated whether the conventional methods include trucks with air ducts dispersing the air to several areas of the interior.

The report indicates the system is inexpensive and easy to install. Cooling is more evenly distributed. Control is excellent, pull-down time is shorter and humidity is lower with the packages drier and easier to handle. The disadvantage is the cost of the nitrogen. They report that dry ice costs about 4 cents a pound, liquid carbon dioxide 4 to 5 cents, and liquid nitrogen 2 to 8 cents. It is sold on a sliding scale and to get the lower rate large quantities must be used.

No-Air Inclusion Quick-Connect Coupling Developed

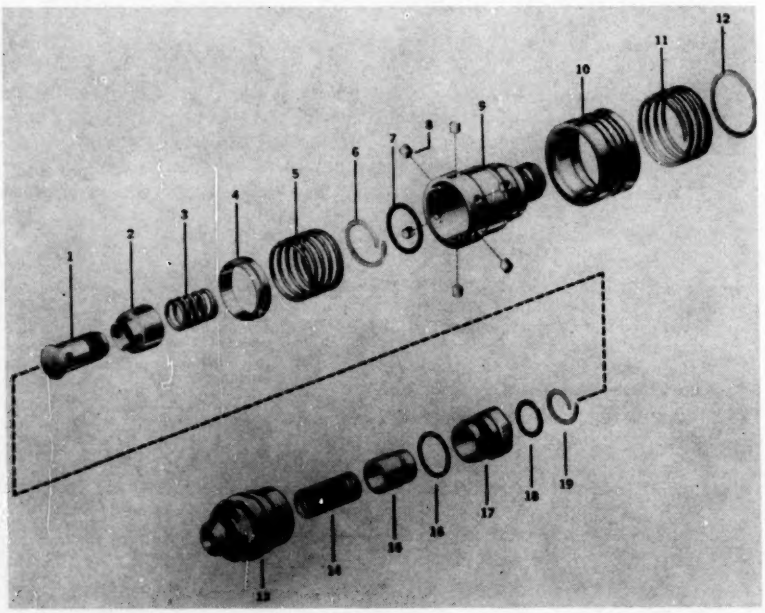

Fig. 2

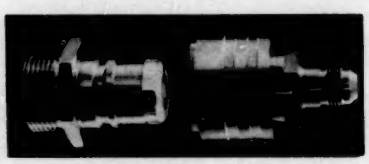

Fig. 1

»»» JACK & HEINTZ, Inc., a prime designer and manufacturer of systems and components for the general industries, announces production of a new design for No-Air Inclusion type quick-connect couplings.

Tradenamed Trigger Lock and coded Series 17, these couplings form a complimentary line to the Series 10 and 11 Roto Lock couplings announced in June of this year. The new Trigger Lock is aimed specifically at those applications calling for minimum leakage on disconnect and minimum entrapment of air or other foreign matter on connect.

Minimum leakage on disconnect has become increasingly vital in the handling of most exotic fluids. Leakage here can produce burns to personnel, explosion or toxicity. Minimum entrapment on connect is particularly important in systems where stability and control may be affected by the inclusion of air or foreign elements in the fluid line.

The new coupling meets these needs, exhibiting leakage and entrapment figures below those of contemporary, comparable-purpose couplings. In addition, it brings improved space, weight and performance advantages to the user.

How It Operates

Trigger Lock elements and their relative positions in "open" and "close" are shown in Fig. 2, 3 and 4. Principal points on design, disconnect action and connect action are:

Design; The exploded view, Fig. 2, shows the details of the valve design. Essentially, the design and action are similar to that of a piston and cylinder.

In the nipple, the valve (part 15) acts as a piston and the sleeve (part 17) acts as a cylinder. In the socket, the valve (part 1) is the piston; the sleeve, (part 2), the cylinder.

Note that both valves have ports. These ports act as the fluid passages.

Action of the nipple valve is opposite to that of the socket valve. In the nipple, the spring loaded valve moves axially; the sleeve is fixed. In the socket, the valve is fixed; the sleeve is spring-loaded and moves axially.

Action to Connect: When the coupling is disconnected, the ports in the nipple are sealed by the nipple valve (part 17), while the ports in the socket half are sealed by the socket sleeve (part 2).

As the operator inserts the nipple (very little force is required

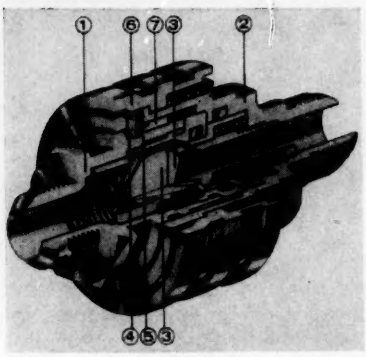

Fig. 3

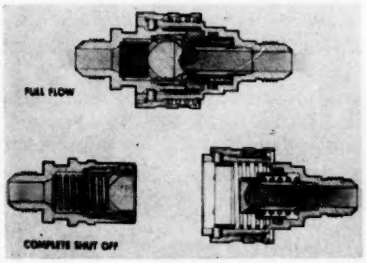

Fig. 4

because of the balanced area design), the socket valve is opened by the nipple nose retracting the socket valve sleeve. Simultaneously, the flush face of the socket valve opens the nipple valve by compressing its spring.

At a predetermined point, a raised diameter on the nipple body (part 13) contacts the retaining ring (part 4) and moves this ring backwards against its spring (part 5). The backward movement of this ring releases the locking pins (part 8) which thence are cammed into a groove in the nipple body by the action of the spring-loaded socket collar (part 10). As soon as the pins are engaged, by the snap action of the collar spring, (part 11), a very quick, tight lock of the coupling results. There is a definite audible signal when this action takes place. The trigger-like characteristic of this entire action is the basis for the trade name Trigger Lock.

As soon as the valves are opened, the flow ports are exposed and full fluid flow takes place. It should be noted that the ports cannot be uncovered until a perfect seal has taken place between socket and nipple and that all air that may have been entrapped is forced out of the coupling before any flow takes place.

This action insures that an absolute minimum of air (if any) enters the system. Field tests on the ½" Trigger Lock show that less than 0.10 cubic inches of air may at times be included during coupling. This volume is far below current military specifications on no-air inclusion couplings.

When connected, the fluid passage of the connected coupling is direct and free of restriction, see Fig. 2.

Action on Disconnect: The operator moves the socket collar (part 10) axially to its most rearward position. This releases the retaining ring (part 4) which moves forward under its spring pressure (part 5) and locks the pins (part 8) in the open or "cocked" position. At the same time, the spring load on the nipple valve (part 15) forces it to the closed position . . . its face flush with the nipple valve body . . . thus sealing its ports. The socket valve is closed similarly by the socket sleeve (part 2) being moved forward, closing the socket ports. Field tests show that less than 2.2 cubic centimeters of fluid escape on disconnect. Again, this is far below volume quoted.

CHILLED BY HIGH FREEZING COSTS?

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You'll warm to industrial refrigeration economically designed and manufactured by Kohlenberger. Here's *complete* service covering every aspect of your refrigeration needs...from equipment manufacture and system design to plant layout and field erection. Since 1922 Kohlenberger Engineering Corporation has built its reputation on the skill of its engineers . . . the dependability of its equipment. We'd like to show you how you'll benefit. Write for literature or phone LAmbert 5-3521.

1. **KMV Compressor:** 20-200 HP. Heavy duty, high speed industrial refrigeration compressor units for ammonia and freon refrigerants.

2. **KE Condenser:** Heavy duty industrial evaporative condenser. 10-200 tons.

3. **Krakice Maker:** 10-60 ton ice capacity per unit. For every crushed ice requirement.

4. **Unit Cooler:** Industrial floor-type unit cooler for ammonia, freon and brine refrigerants. 5-30 tons.

Franchises available for qualified industrial refrigeration contractors. Contact C. R. Kohlenberger, president.

KOHLENBERGER ENGINEERING CORPORATION

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Book Review

HANDBOOK OF INSTRUMENTATION AND CONTROLS, *A Practical Manual for the Mechanical Services Covering Steam Plants, Power Plants, Heating Systems, Air-conditioning Systems, Ventilation Systems, Diesel Plants, Refrigeration, and Water Treatment.* By Howard P. Kallen, Partner, Kallen & Lemelson. 692 pages, 6 x 9, 550 illustrations. $15.00

Planned to help the reader determine how to best select and effectively apply instruments and control systems for mechanical services in commercial, institutional, and industrial buildings, this newly published handbook provides a wide range of authoritative and quantitative data. Extending from basic facts on instruments to thorough descriptions of complete control systems, this guide presents important information needed to procure or design equipment.

In treating instrumentation for pressure, temperature, flow, liquid level, pH and conductivity, combustion, and boiler controls, the needs of the engineer who designs and develops instruments, as well as the application engineer, were kept in mind. Similar consideration for the practical needs of engineers, technicians, and others is extended in the coverage of turbine-generator, heating system, air-conditioning system, refrigeration, diesel engine, and other controls.

Lengthy, complicated discussions are omitted in favor of many quick-reference data. Numerous clear illustrations, and tables, charts, and graphs are used to convey technical aspects of instrumentation. Of particular interest is the presentation of many control systems that are completely illustrated to demonstrate modern practice in the field. Typical practical applications of all controls are described.

Specialized phases, including boiler and combustion controls, boiler flame-failure safeguards, and the fundamentals of instrument system design are covered. Also the book includes newer developments such as control systems for high-pressure steam power plants, and controls for large central air-conditioning systems found in office buildings, hospitals, schools, and other commercial and institutional buildings.

Howard P. Kallen is a partner in Kallen & Lemelson, consulting engineers, a firm that specializes in the design of mechanical services systems for commercial, industrial, and institutional buildings. Formerly, he was chief mechanical engineer for Frederic R. Harris, consulting engineers, and an associate editor of Power. He is a member of the American Society of Mechanical Engineers and the Instrument Society of America.

Safety Training Course For Foremen Available

»» AN effective, low-cost safety training course for industrial foremen has been developed by the National Safety Council.

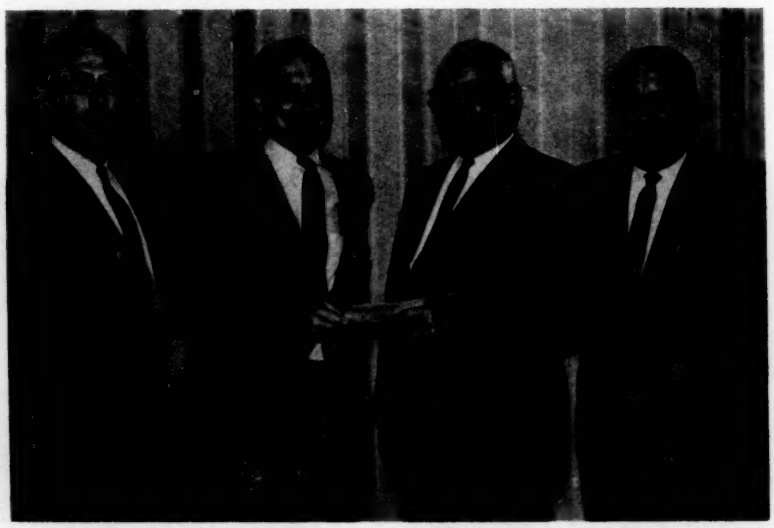
Written by training-expert Glenn Griffin of the University of Michigan's Bureau of Industrial Relations, the course consists of a series of six text booklets entitled "Men and Motives in Safety Supervision," and a manual for group leaders.

Each text booklet is for a one-hour training session for foremen. The leader's manual tells how to set up meetings and apply the material to individual plant situations.

The course offers practical instruction on ways a foreman can better understand his men and work with them toward safer, more efficient work practices. "Griffin's style is clear and down-to-earth," according to the National Safety Council.

Further information about "Men and Motives in Safety Supervision" is available from the Council, 425 N. Michigan Ave., Chicago 11, Ill.

TRRF Makes Grant For Low Temperature Research



A check for $4500 launching a long-range program of research in low temperatures passes from The Refrigeration Research Foundation to Colorado College. From left to right are Professor Wilbur H. Wright, Physics, who will direct the project; W. R. Brossman, vice president of the college; Millard W. Young of San Francisco, president of The Refrigeration Research Foundation, and Dr. Walter A. Maclinn, Director of The Foundation.

»» LOW temperatures that will make Fraser seem like a summer resort are soon to be commonplace in Colorado Springs.

A research project involving temperatures as low as 450 degrees below zero Fahrenheit has been revealed by The Refrigeration Research Foundation of Colorado Springs. Colorado College will conduct the work to see how biological and other materials behave at these very low temperatures.

Announcement of an initial grant of $4500 for the project was made by Millard W. Young of San Francisco, president of The Refrigeration Research Foundation. He said the fund would go primarily to purchase the highly specialized equipment needed in the research.

Dr. Wilbur H. Wright, Colorado College professor of physics, who

gained his experience in low temperatures at Rutgers University, will direct the studies. He explained that matter behaves in unusual ways at temperatures in the very low ranges. He said the project will be a long-term, basic academic research into the reasons why.

The program will be carried out on an interdepartmental basis with Professors Robert Z. Brown, zoology, and Lester A. Michel, chemistry, representing their departments. It is expected that Colorado College students will undertake much of the work on a special-project basis.

The Refrigeration Research Foundation, with headquarters at 12 North Meade Avenue in Colorado Springs, is directed by Dr. Walter A. Maclinn. Organized in 1943, the Foundation functions to advance the scientific techniques of refrigerating perishable commodities. It represents a membership of some 150 organizations in the refrigeration industries.

The Foundation sponsors a broad program of research at universities and other institutions. It also serves as an information clearing house on refrigeration problems. Translation of foreign scientific reports for this information service is handled by Colorado College faculty members and students.

ASHRAE Meets February 13-16

>>> THE Semi-Annual Meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) will be held at the Conrad Hilton Hotel in Chicago, February 13-16, 1961.

Concurrently, the 15th International Heating and Air-Conditioning Exposition, held under the sponsorship of ASHRAE, will take place at the International Amphitheatre. Nearly 500 exhibitors are planning displays for this show, which will assemble a vast array of heating, refrigerating, ventilating and air-conditioning equipment.

The ASHRAE meeting program features a series of four technical sessions, five symposiums, conferences, forums and committee meetings. The program has been carefully designed to capture the interest of all segments of ASHRAE. The daily technical sessions and symposiums, covering such subjects as Combustion, Insulation, Refrigeration, and Ventilation, will be conducted in the mornings to permit attendance at the Exposition in the afternoons and evenings.

H. G. Gragg of Chicago is chairman of the General Arrangements Committee, assisted by members of the Illinois Chapter, ASHRAE officers and staff.

ARW-TRRF Annual Meeting To Be Held in San Francisco March 26-30

>>> THE speaker program for the joint meeting of the National Association of Refrigerated Warehouses and The Refrigeration Research Foundation to be held in San Francisco, California, March 26 to 30 has just been released. It is an excellent and well diversified

CRACKED ICE

HARD SANITARY ICE AT LOWER COST

Tippmann Plate Ice Maker

- Simplified control.
- Ice manufactured, handled and dispensed more economically.
- No snow, slush or waste.
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- Sizes 1 to 200 tons.

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for pre-cooling and preserving foods

Series "M" King Koolers operate with low velocities in the cooler to maintain temperatures of 34° to 50° F., using ammonia or Freon refrigerants. Centrifugal blowers pull air through the cooling coil for efficient heat transfer. Featuring automatic temperature and refrigerant control, system defrosts during off cycle. Water defrost methods are also available.

King Product Koolers are easily and quickly installed and serviced . . . assuring economy, efficiency, safety. Ceiling suspended and floor types are available in a complete range of sizes from 3,000 to 18,000 C.F.M.

PRODUCT King COMPANY OF OWATONNA

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sharp freeze, cooling, ventilating and heating systems.

program of discussions. Here is what you will hear:

Voluntary Frozen Food Handling Practices—Research findings and industry facts and their meaning for public refrigerated warehousemen.

TRRF Sessions—Two half days of TRRF meetings will give you usable, valuable information. You'll tour USDA's Western Lab too for a better understanding of frozen food handling research.

Operating Expense Comparisons—Hear the CPA's analysis of California's first year cost figures . . . a warehouse manager describe the benefits to management and a warehouse accountant tells of the ease with which the system was installed.

Protection of Management Rights—Labor lawyers will discuss contract negotiations, what to do when the union comes, what happens under arbitration, how to keep the office from becoming unionized.

Storage, Handling Automation—Jerseymaid's automation film will be shown and one of their executives will answer questions. Slides of automated and semi-automated operations in public refrigerated warehouses will be shown and discussed.

Dock Operations—Pros and cons of truck precooling processes and of the various means of taking product temperatures.

The Businessman's Economic Future—A man who knows will tell you what it is. Long Range Plan Progress Report—The President of the research firm conducting the basic research will release his findings, which will be the base of the long range plan, and more effective association services for you.

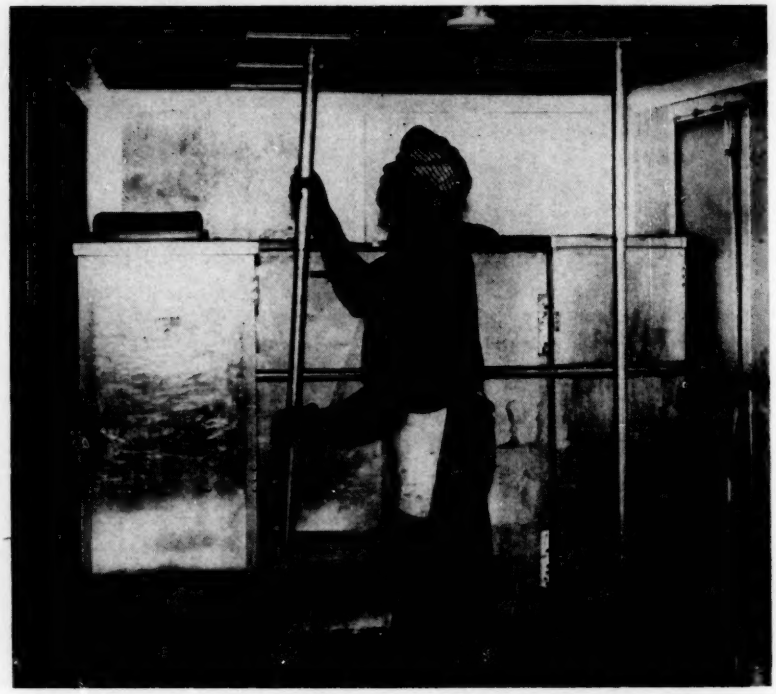
Office Mechanization—Possibilities for public refrigerated warehouses will be presented.

Fire & Legal Liability Insurance—New developments of special significance will get your interest.

In addition to the above program there will be discussions on truck detention rulings; state income tax legislation status; report on meeting of chapter officers; containerization.

TRRF scientific advisory council will be available for personal discussion on individual problems.

Load Holder For Trucks Snaps In Belt Rails



Something new has been added to load-holder spring-loaded, telescoping, steel tubes which snap into perforated hat-section belt rails . . . this is the addition of an adjustable section which allows a variance in the length of the brace rod of 16". This permits the user to put on the correct amount of spring pressure either in a vertical or a horizontal positioning of the rods within the 16" limit. Will fit any dimension, either vertically or horizontally, from 78" to 94". Adjustment takes only 2 seconds and requires no tools. Has no protruding wires to snag cargo. Belt rails are simple and easy to install with hexhead screws or rivets.

NARW Begin Two New Activities

››› TWO new and important activities have just been undertaken by the National Association of Refrigerated Warehouses. One is the development of a long range plan for association services; the other is establishment of a Promotion & Public Relations Committee.

The long range plan will be a blueprint of programs and services which the association may undertake to more effectively meet the anticipated needs of its members over the next ten years. In the development of this plan present and possible future services will be evaluated in the light of probable changes in industry technology and markets. A five month research study, which will serve as the basis for the plan, is being conducted by Leo J. Shapiro and Associates, Chicago.

The Promotion and Public Relations Committee will develop and carry out a program for more effectively telling the story of public refrigerated warehousing. The committee is chairmanned by C. A. Martin, Jr., of Nashville.

This committee brings to eight the total of NARW committees actively functioning in various areas affecting public refrigerated warehouse operations.

Industrial Packaging Course At Purdue University

››› THE ninth annual two-weeks on-campus Purdue University course in Industrial Packaging will be given this season in Lafayette, Indiana, from March 20 to March 31, 1961.

This opportunity for executives, purchasing agents, engineers, military packaging men, salesmen and others involved in packaging to obtain a thorough knowledge of containers and packaging materials has become established as one of the finest programs of packaging education in existence. Those who attend this course, away from business distractions for two weeks, are given a comprehensive coverage of the whole field of industrial packaging in surroundings conductive to intensive concentration.

The course will be coordinated by the packaging consultant, Charles J. Zusi, who fits together into logical sequence the lectures and demonstrations of some of the leading authorities in the packaging field and a number of the engineering professors of the highly competent staff of Purdue University. Practical discussion of current packaging problems is stressed in special evening sessions.

Among the regular lecturers from industry are such well-known men as J. Lee Ferguson, Jr., general manager of J. L. Ferguson Co., W. B. Lincoln, vice-president of Inland Container Corporation, K. F. Vasiliou, director of Package Research Laboratory, Burton Williams, chief engineer of Freight Container Bureau, R. F. Uncles, packaging director of American Cyanamid Co., and at least twenty others of similar high calibre.

For additional information, and registration blanks, write or call, Mark E. Ocker, Division of Adult Education, Memorial Center, Purdue University, Lafayette, Indiana, Phone 92-2533.

Frozen Food City To Begin Operating This Year

"Frozen Food City", a vast, new project of Merchants Refrigerating Company of New York City, is nearing completion in Secaucus, New Jersey and is scheduled to begin operations early in 1961.

Located 20 minutes from the heart of New York, a 25 acre tract will provide a completely integrated refrigeration program combining processing, warehousing and retail store distribution.

Merchants' new 3,100,000 cubic foot, single-story warehouse will provide frozen food processors with the most up-to-date refrigerating facilities and equipment. The giant freezer storage room will be kept at a uniform minus 10 degree temperature by an automatically operated refrigeration system, using Refrigerant 12, and by 16 Niagara "No Frost" room evaporators using Glycol solution over coil surfaces.

In addition to the freezer storage room, there will be a cooler storage room operating at temperatures between 28 degrees and 30 degrees.

Both storage rooms, as well as all other parts of the building, will have complete sprinkler systems supplied by the 100,000 gallon gravity secondary elevated water supply tank.

"Frozen Food City" will offer extensive platform space for the most efficient loading and unloading of merchandise. The entire platform is to be enclosed and air conditioned, with underfloor warming coils to control humidity conditions. There will be a total of 41 truck loading doors, 10 of which will have hydraulically operated, adjustable loading platforms. Directing the truck activity is a separate control center adjoining the truck platform.

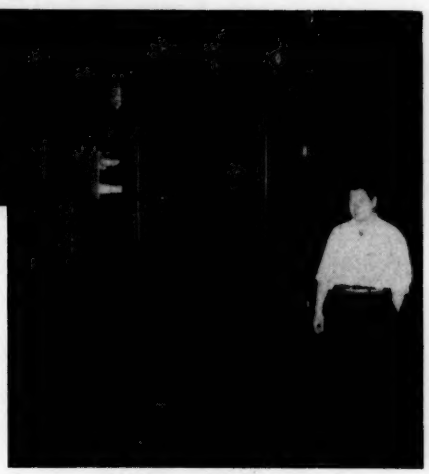
The rail car platform, with a total of 6 car unloading doors, will be similarly enclosed and air conditioned to maximize product safety.

The entire mezzanine area above the truck platform will be available as office space for tenants and warehouse personnel. For comfort, the office space is to be fully air conditioned. The engine room has been located in the basement beneath the repair shop and rail car platform.

The 8 acres adjoining the main warehouse are available as a building site for frozen food processors. To encourage processors to build, Merchants has undertaken to make available complete utility facilities. These include electricity, water, gas, telephone, sanitary and storm drainage facilities, and a system of access roads.

One of the many advantages of locating at "Frozen Food City", according to a company spokesman, is the drastic reduction in transportation costs in getting the finished product from processor to

THE ULTIMATE IN THE COMPRESSION REFRIGERATION CYCLE*



THIS IS ANOTHER CYCLE CENTER, factory assembled and on its way to a 150 ton poultry freezing plant.

What will it do?*

It will provide liquid overfeed to the evaporators, catch the excess liquid and recirculate it to the evaporators, with these results:

- FULL COMPRESSOR PROTECTION AGAINST SLUGS
- PEAK COIL AND COMPRESSOR EFFICIENCIES
- SUB COOLED LIQUID FEED AT CONSTANT PRESSURE THE YEAR AROUND
- PRACTICALLY UNLIMITED RATE OF LIQUID FEED AT ABSOLUTELY NO POWER COST
- NO MECHANICAL PUMPS
- NO FLASH GAS IN LIQUID LINES
- SAFE, AUTOMATIC PLANT OPERATION
- OIL SEPARATION, ANY REFRIGERANT
- HIGHER SUCTION PRESSURES
- LARGE POWER SAVINGS
- LARGE SAVINGS IN FIRST COST ON NEW PLANTS. FOR EXAMPLE, THE RECEIVER IS NOT REQUIRED AND SURGE DRUMS ARE ELIMINATED.
- AUTOMATIC HOT GAS DEFROSTING AT MINIMUM COST

ASK FOR BULLETIN CC-2

* NOT JUST A LIQUID RETURN UNIT. Available for any refrigerant, in capacities from 10 to 1,000 tons and more. Factory assembly is optional.

J. E. Watkins Co.
307 LAKE STREET, MAYWOOD, ILLINOIS

the retail store, as regular pickup and delivery service will be provided by Merchants for processors located on this site.

Through the Howell Trucking Co., Inc., a subsidiary of Merchants, a complete frozen food service from warehouse to retail outlets will be available. The Frozen Food Service Division performs the following services: Inventory control, order taking, selection of product, checking, truck loading and all clerical work pertaining to the accountability of product. The Howell trucks in turn provide a scheduled retail store delivery to all Howell accounts in New York City and within a radius of 100 miles.

Merchants Refrigerating Company is a member of Trans-American Refrigerated Services, Ltd., a national affiliation of independent refrigerated warehouse companies and known throughout the country as TARS.

Refrigerated Pizza Paid-off In This Plant

»» FREEZER-QUEEN Inc., founded 2½ years ago with a force of only four women making pizza, has started operations in a new large plant.

President Paul L. Snyder said the work force will be increased to "upwards of 100 people." The plant now has roughly 75 workers on three shifts.

Freezer-Queen has leased about 7500 square feet of space, in the plant. The plant will produce refrigerated pizza. Executive Vice President Charles R. Spalla said plans are being made to produce frozen sandwches here also.

Freezer-Queen's much smaller plant at 728 Big Tree Rd. in Orchard Park has been closed. The company will continue to maintain offices at 3041 Bailey Ave. but will have its headquarters in the new Mohr St. plant.

Freezer-Queen said its gross sales this year will hit about $4,500,000, approximately double the level of last year.

The company also operates two other plants—one in Marion, O., employing about 125 in the manufacture of packaged frozen beef steaks, and the other in Cleveland, employing 50 in the production of refrigerated pizza. The company is one of the largest in the country in the manufacture of packaged frozen beef steaks.

Ammonia Distributors For Armour

»» FOUR new anhydrous ammonia distributorships covering six locations are announced by Armour Industrial Chemical Company.

Merchants Company, Inc., 300 E. Pine Street, will warehouse, sell and deliver ammonia in cylinders in Hattiesburg, Miss. The same company will be responsible for sales in Gulfport and Vicksburg, Miss.

Other new distributors are Sierra Chemical Company, 1450 E. 2nd street, Reno, Nev.; Thompson-Hayward Chemical Company, 222 Sequin Road, San Antonio, Texas; and Midwest Carbonic Company, Inc., 106 First Street, Madison, Wis.

Carbide Names Husted and Gray To Marketing Posts

»» APPOINTMENT of E. E. Husted as Manager—Fluorocarbons Marketing, and Charles F. Gray as Sales Manager—UCON Refrigerants for Union Carbide Chemical

E. E. Husted

C. F. Gray

Company, Division of Union Carbide Corporation, is announced. The two will work closely in expanding Carbide's program of sales and service to the air conditioning and refrigeration industries.

For the past two years, Mr. Husted was manager of UCON Fluorocarbon sales to the aerosol industry. He joined Carbide in 1945 and for five years served as a Technical Representative selling synthetic organic chemicals to the plastics, paint and lacquer, textile specialties, and petroleum industries.

Mr. Gray was formerly a technical representative of the UCON propellant marketing group working out of the company's Chicago office. He joined Union Carbide Chemicals Company in 1952 and served as technical representative for chemical sales and service in the Western Michigan territory; New York, N. Y.; at the Mellon Institute, Pittsburgh; and in Philadelphia. He was named to his most recent post in 1958.

New Distributor For Metal Hose

»» IN LINE with the company's recently announced expansion program, Allied Metal Hose Company (Long Island City, N. Y.) has appointed the Louis H. Hein Company (1151 Matsons Ford Road, West Conshohocken, Pa.) as a major new stocking distributor. Hein will carry a complete line of "Allflex" flexible metal hose and connectors, on an exclusive basis in the greater Philadelphia and surrounding area.

According to Fredric (sic) R. Cahn, Allied's director of sales, "Signing this agreement with the Hein Company represents a very real step forward for Allied. This distributor is well-known in the area for his large stock of metal, plastic-lined, and hydraulic hose, and for the knowledgeable service he renders his customers."

B&G Guide To Cooling Tower Pumps and Piping

»» AN easy-to-follow six-step guide to help designers of cooling tower installations plan their pump and piping requirements has been published by Bell & Gossett Co., Morton Grove, Ill.

"Six Step Manual for Sizing Cooling Tower Pumps and Piping," an eight-page booklet illustrated with diagrams and charts, is offered as a convenience to the designer to help him select a pump for his system that will afford minimum installation and operating cost, yet assure a proper circulation for the entire system.

The six steps, all of which are fully explained in the new guide, are briefly described as follows:

1. Determine amount of water in gallons per minute to be circulated to the tower.

2. Make a layout showing the complete piping system.

3. Determine the static head and

pressure drop through units other than pipe and fittings.

4. Select the pump.
5. Size the pipe.
6. Check pump and pipe sizes.

A page of charts illustrating the capacities in gallons per minute of B&G's series 1522 and 1531 pumps is included in the booklet to help designers select the most appropriate pump in light of whatever pressure head is involved.

Also included are two tables, one showing total equivalent pipe footage for different pump pressure heads, the other showing the carrying capacities of various pipe sizes in gallon per minute.

Free copies of "Six Step Manual for Sizing Cooling Tower Pumps and Piping" may be obtained by writing to Bell & Gossett Co., Morton Grove, Ill.

Brochure On Pipe

»» WEIGHT computations for welded steel tubing are easily obtained from tables in a new brochure prepared by the Electric-weld Tube Division of Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh, Pa.

Tables in the handy 16-page brochure give dimensions and weight per foot for round mechanical tubing up to 10 inches square and rectangular tubing up to 5 inches, and pressure tubing up to 5 inches.

A full-page table gives decimal equivalents for fractional parts of a pipe foot. Another presents diameters and weights for pipe sizes (plain ends).

Liquid Chiller Brochure

»» A NEW 10-page, 2-color illustrated bulletin (No. 3926) describing the new Versare hermetic packaged liquid chiller line is now available from American-Standard Industrial Division, Detroit 32, Michigan.

The new bulletin describes and illustrates the standard mechanical and electrical features of the equipment. Tabulation of net rated capacity is presented along with charted cooler and condenser pressure drops. A step-by-step selection procedure with a selection example is also included to simplify proper use of the bulletin, thereby increasing its utility for the specifier or buyer of water chiller equipment.

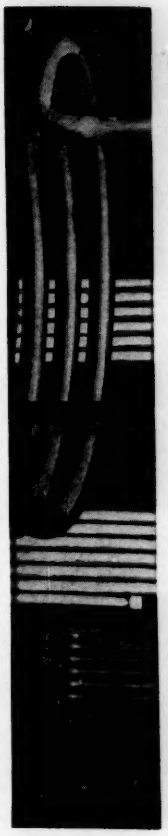
A typical set of engineering specifications for liquid chiller callout is presented as a guide to engineers and buyers. Tabulation of dimensional and physical data for both water-cooled and remote condenser models is correlated with outline type dimensional drawings, permitting determination of major system layout and installation information right from the bulletin.

Catalog On Temperature Controls

»» NEW Catalog G-25 shows complete line of differential expansion type temperature controls available from Burling Instrument Company. Included is a general description of their operation together with a picture and brief specifications of each model.

Both electric and pneumatic instruments are covered. Instruments are available for temperatures up to 2000°F and in choice of standard, water tight, or explosion proof enclosures.

Catalog G-25 is available from Burling Instrument Company, Chatham, New Jersey.



PIPE BENDS

Coils, Headers and Fabrications . . .

the tougher the job, the better our expert metalworkers like it. With their modern equipment, they produce the finest work to your precise specifications. In any metal, even stainless steel, or up to 6-inch extra heavy. For fast, quality bends, backed up by more than 40 years specialization, call on us!

May we quote on your next job?

CHICAGO NIPPLE

MANUFACTURING CO.
1997 Clybourn
Chicago 14

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

USED EQUIPMENT—wanted & for sale

REFRIGERATION EQUIPMENT FOR SALE
Advise Us Your Needs
Use QUICKSEAL—stops brine tank leaks.
Use CLERTEMPICE—clears and tempers ice.
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Chicago 4, Illinois. WAbash 2-3299

FOR SALE
2— 100 h.p. Carrier brine chilling units.
1— 10x10 York direct connected 100 h.p.
2— 8x8 Yorks, 60 h.p. each, 360 r.p.m.
2— 5x5 Yorks 15 h.p. each.
1— type 100 Flynn & Emrich ice cubing machine.
JOHN F. CARSON
A & Venango Sts. Philadelphia 34, Pa.
GArfield 6-2221

FOR SALE—AMMONIA EQUIPMENT
2— 300 ton Niagara evaporative ammo. condensors.
1— 14x12" 4-cyl. Frick comp. D.C. to 600 h.p. motor, 327 r.p.m.
1— Worthington horiz. booster D.C. to 150 h.p. motor, 300 r.p.m.
2— 1 ton York ice making plants, 50# blocks, portable gasoline driven.
1— 10x10" 4-cyl. Frick duplex D.C. 225 h.p. motor.
3— 10x10" 4-cyl. York duplex D.C. 225 h.p. motor.
1— 9x9" 4-cyl. York duplex D.C. 150 h.p. motor.
3— 10x10" 2-cyl. York D.C. to 100 h.p. motor.
1— 9x9" 2-cyl. York D.C. to 75 h.p. motor.
2— 10x10" 2-cyl. York with V-type flywheel.
1— 9x9" 2-cyl. York with V-type flywheel.
2— 7-1/2"x7-1/2" & 8-1/2"x8-1/2" 2cyl. Vilters.
3x3", 4x4", 5x5" & 6x6" York & Frick comp.
3x3", 4x4" & 5x5" York Condensing units.
4— shell and tube condensers, 25 ton cap.
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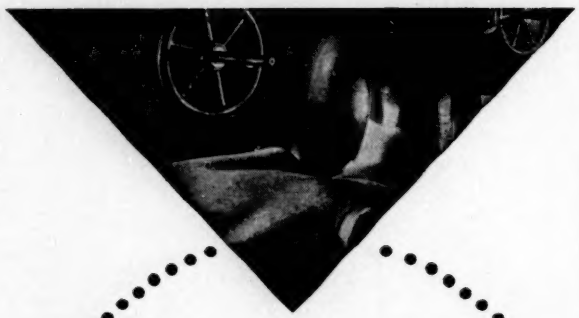

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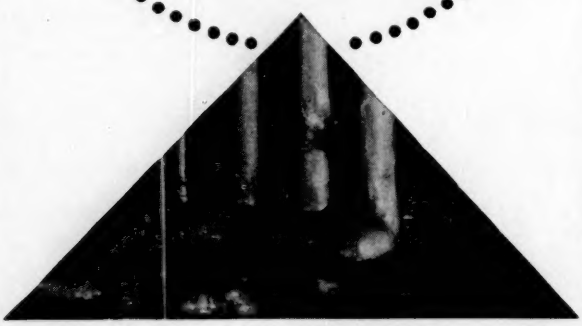

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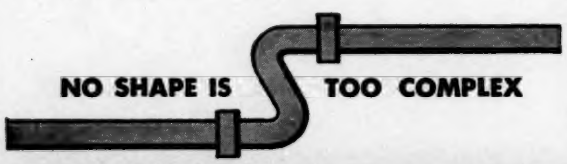

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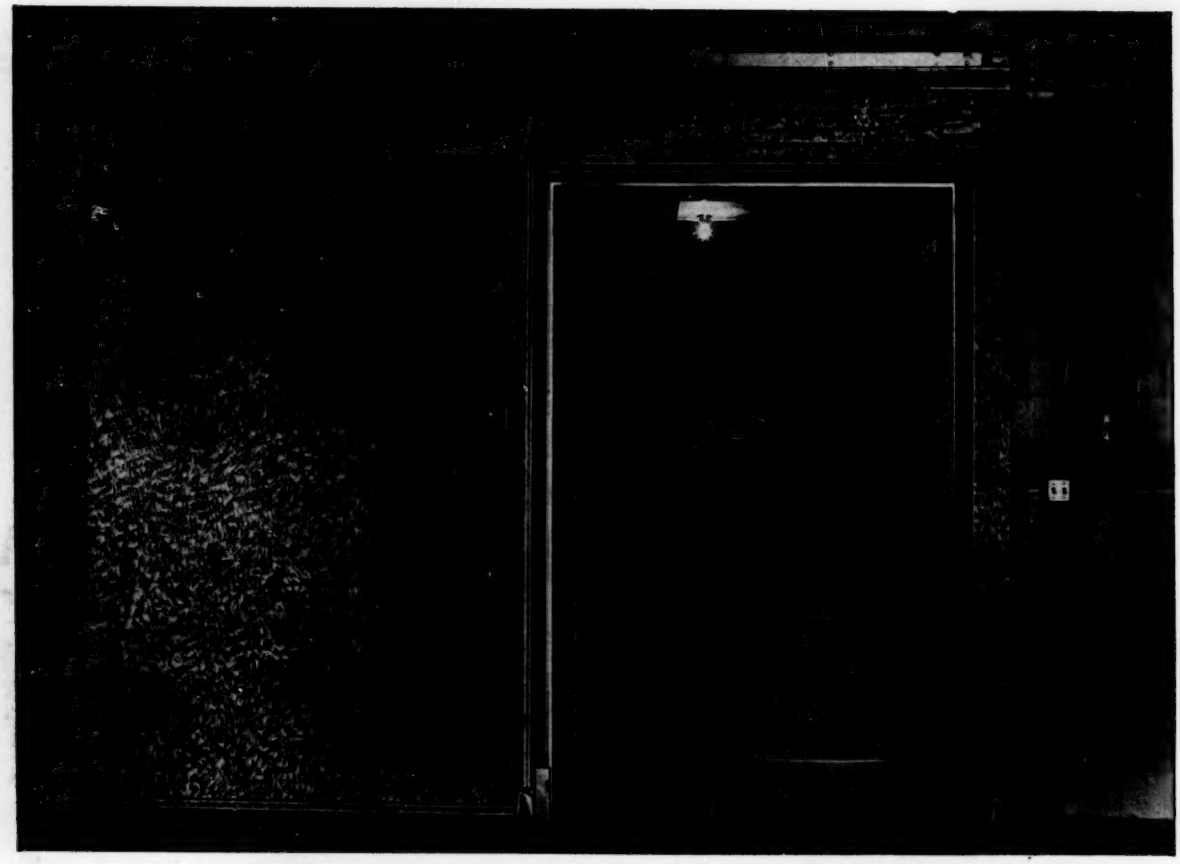

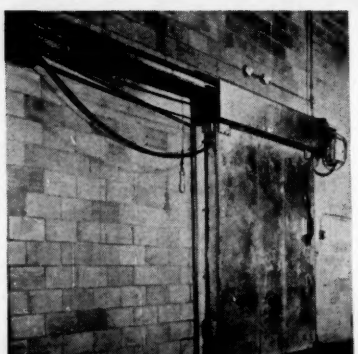

FAST OPERATION of Electroglide Freezer Door saves refrigeration. Note Jamison Frostop® installed to prevent icing and freezing.

POSITIVE SEAL. When door reaches closed position, exclusive Jamison camming action forces door *in* and *down*.

Photos Courtesy: National Tea Company,
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